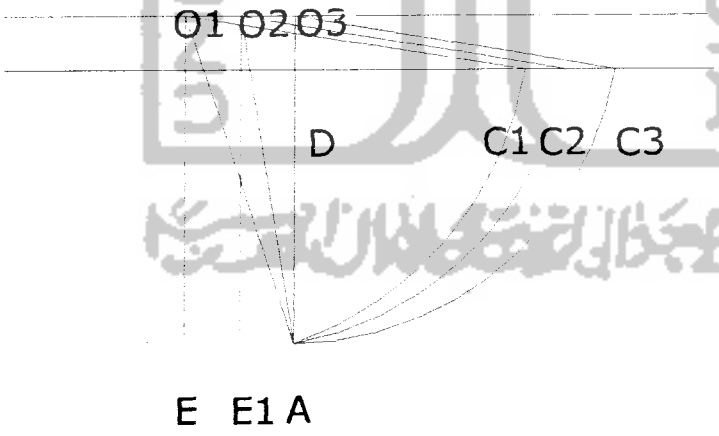
BAB V

ANALISIS STABILITAS LERENG

5.1 Analisis Stabilitas Lereng

Pada kasus ini analisis dilakukan dengan menggunakan metode Fellinius dan Bishop dan semua hitungan dimasukkan dalam tabel dengan program excell. Untuk mendapatkan hasil analisis yang benar, langkah pertama adalah penentuan R kritis. Penentuan nilai R kritis adalah R yang didapat dari panjang koordinat O dan A. R kritis dapat dilihat pada gambar 5.1.



Gambar 5.1 Penentuan R kritis

Perhitungan R dapat dilihat pada tabel berikut:

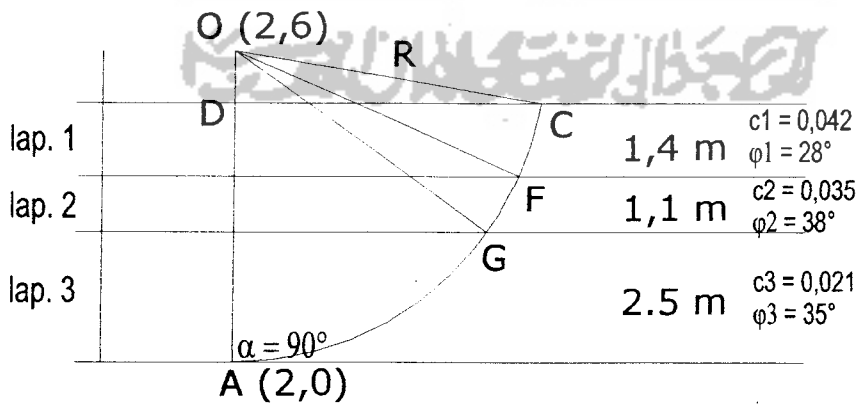
Tabel 5.1 Hitungan R (jari-jari)

	Koordinat O	R (m)	∠AOC (^{0})	Luas AOC (m^2)
O1	(0,6)	6,325	62,47	21,798
O2	(1,6)	6,083	71,075	22,939
O3	**(2,6)**	**6**	**80,406**	**25,247**

Dari tabel diatas R yang dipakai (R kritis) adalah pada koordinat O3 (2,6) dengan R = 6 m, dan sudut AOC = 80,406^0. Pemakaian koordinat O3 dikarenakan mempunyai bidang longsor yang paling besar (Luas AOC). Dan selanjutnya R dan sudut AOC tersebut dipakai untuk semua perhitungan (untuk semua sudut kemiringan).

Contoh hitungan yang dipakai adalah pada semua sudut kemiringan dengan jumlah pias 6, dan untuk semua hitungan adalah berbentuk tabel.

5.2 Perhitungan Untuk Sudut Kemiringan 90^0



Gambar 5.2 Koordinat dan bidang longsor pada sudut 90^0

Ko Hitungan stabilitas lereng dengan sudut 90^0 dan jumlah pias 6.

Menentukan koordinat awal, titik A = (2,0) dan O = (2,6).

Koordinat E = (0,0); koordinat B didapat (0,5) dan koordinat D = (2,5).

Panjang OB $= L\overline{OB} = 1$ m, $L\overline{OA} = R = 6$ m.

$L\overline{CD} = \sqrt{L\overline{OA}^2 - L\overline{OB}^2} = \sqrt{6^2 - 1^2} = 5{,}916$ m.

Koordinat C (XC,YC):

XC $= L\overline{CD} + XO = 5{,}916 + 2 = 7{,}916$ m ; YC = 5,0 m.

Jadi koordinat C = (7,916;5).

Koordinat D (XD,YD) = (2,5)

Koordinat E didapat: (0,0).

$L\overline{OC} = R = \sqrt{(XA - XO)^2 + (YA - YO)^2} = \sqrt{(2-2)^2 + (2-6)^2} = 6$ m.

$L\overline{OA} = R = 6$ m, $L\overline{BC} = XO + L\overline{CD} = 2 + 5{,}916 = 7{,}916$ m.

$L\overline{OE} = YE - YO = 6 - 0 = 6$ m, $L\overline{EA} = XA - XE = 2 - 0 = 2$ m.

Koordinat F:

$XF = \sqrt{(L\overline{OA})^2 + (L\overline{OE} - YF)^2} + 2 = \sqrt{(6)^2 + (6-3{,}6)^2} + 2 = 7{,}499$ m.

$YF = H_2 + H_3 = 2{,}5 + 1{,}1 = 3{,}6$ m.

Jadi koordinat F: (7,499;3,6).

Koordinat G:

$XG = \sqrt{(L\overline{OA})^2 + (L\overline{OE} - YF)^2} + 2 = \sqrt{(6)^2 + (6-2{,}5)^2} + 2 = 6{,}873$ m.

$YG = H_3 = 2{,}5$ m.

Jadi koordinat G: (6,873;2,5).

Koordinat H: (XC + 2,YO) = (5,916 + 2;6) = (7,916;6).

$\angle$ COD = arc tan $\frac{\overline{LBC}}{\overline{LOB}}$ = arc tan $\frac{6}{1}$ = 80,406^0.

$\angle$ AOC = $\angle$ COD = 80,406^0.

$\angle$ COF = 2 x arc sin $\left(\frac{\left(\sqrt{(XC - XF)^2 + (YC - YF)^2} / 2 \right)}{R} \right)$ = 13,984^0.

$\angle$ FOG = 2 x arc sin $\left(\frac{\left(\sqrt{(XF - XG)^2 + (YF - YG)^2} / 2 \right)}{R} \right)$ = 12,107^0.

$\angle$ GOA = arc sin $\left(\frac{\left(\sqrt{(XG - XA)^2 + (YG - YA)^2} \ 2 \right)}{R} \right)$ = 54,315^0.

L $\overline{CF}$ = $\frac{\angle COF}{360}$ x 2π x R = 1,464 m.

L $\overline{FG}$ = $\frac{\angle COF}{360}$ x 2π x R = 1,268 m.

L $\overline{GA}$ = $\frac{\angle COF}{360}$ x 2π x R = 5,688 m.

φ_1 = 28; φ_2 = 38; φ_3 = 35.

c_1 = 0,042; C_2 = 0,035; C_3 = 0,021.

Lebar tiap pias = $\frac{\overline{LCD}}{6}$ = 0,986 m.

Hitungan untuk pias ke 1 dengan metode Bishop:

X_1 = ½ x B = ½ x 0,986 = 0,493 m.

θ_1 = arc sin $\frac{xi}{R}$ = 4,7131^0.

$y1 = \frac{xi}{\tan \theta 1}$ = 5,9797 m.

h1 = L$\overline{CD}$ - (L$\overline{OE}$ - y1) = 5 – (6 - 5,9797) = 4,9797 m.

W = $(B_1 \times h_1 \times \gamma_1) + (B_1 \times h_2 \times \gamma_2) + (B_1 \times h_3 \times \gamma_3)$

= (0,986 x 1,4 x 1,0563) + (0,986 x 1,1 x 1,487) + (0,986 x 2,480 x 2,562)

= 6,5795 t/m.

$C_r \times B_1 = \frac{(c_1 + c_2 + c3)}{3} \times B_1$ = 0,033t/m.

$W \sin \theta_1$ = 6,5795 sin $(4,715^0)$ = 0,5408t/m.

$W \tan \varphi_3$ = 6,5795 tan 35^0 = 4,6094 t/m.

$(c_1 \times B_1) + W \tan \varphi_3$ = 4,641 t/m.

Untuk mencari F dilakukan dengan iterasi yang berulang *(trial and error)*.

Dicari M dengan F coba-coba,

F_0 = 1,700 didapat M_1 pada lapis 1 = 1,03049

$((c_1 \times B_1) + W \tan \varphi_3)/ M_1$ = 4,50413 (pada lapis 1).

$F_1 = (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_1)/ (\Sigma W \sin \theta_1)$ = 1,720.

Dari F_1 didapat M_2 = 1,03009.

$((c_1 \times B_1) + W \tan \varphi_3)/ M_2$ = 4,50586.

$F_2 = (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_2)/ (\Sigma W \sin \theta_1)$ = 1,724.

Dari F_2 didapat M_3 = 1,03003.

$((c_1 \times B_1) + W \tan \varphi_3)/ M_3$ = 4,50516.

$F_3 = (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_3)/ (\Sigma W \sin \theta_1)$ = 1,724.

Karena nilai $F_2 = F_3$, iterasi dihentikan dan didapat nilai F =1,724.

Hitungan untuk pias ke 1 dengan metode Fellinius:

xi = ½ x B = ½ x 0,986 = 0,493 m.

θ_1 = arc sin $\frac{xi}{R}$ = 4,7150^0.

y_1 = $\frac{xi}{\tan\theta_1}$ = 5,9797 m.

h_1 = L$\overline{CD}$ - (L$\overline{OE}$ - y_1) = 5 – (6 - 5,9797) = 4,9797 m.

W = (B_1 x h_1 x γ_1) + (B_1 x h_2 x γ_2) + (B_1 x h_3 x γ_3)

= (0,986 x 1,4 x 1,0563) + (0,986 x 1,1 x 1,487) + (0,986 x 2,480 x 2,562)

= 6,5795 t/m

W sin θ_1 = 6,5795 sin (4,715^0) = 0,5408 t/m.

W cos θ_1 = 6,5795 cos (4,7150^0) = 6,5572 t/m.

ΣW sin θ = 11,76t/m.

ΣW cos θ untuk lap. I + II + III= 24,667 t/m.

ΣW cos θ untuk lap. I + II = 0,7539 t/m.

ΣW cos θ untuk lap. I = 0,1154 t/m.

L$\overline{AC}$ x c = (L$\overline{CF}$ x c_1) + (L$\overline{FG}$ x c_2) + (L$\overline{GA}$ x c_3) = 0,225.

W cos θ x tan φ = (24,667 x 28,000)+(0,7539 x 38,000)+(0,1154 x 35,000)

= 17,922 t/m.

F = ((L$\overline{AC}$ x c) +(W cos θ x tan φ))/(ΣW sin θ) = (0,225 + 17,922)/11,76 = 1,543.

Tabel 5.2 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 90^0 dengan jumlah pias 6

titik	koordinat	
	X	Y
A	2	0
B	0	5
C	7,916	5
D	2,00	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	7,916
L CD	5,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COD	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,700
F1	1,720
F2	1,724
F3	1,724

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,986	1,0563	1,487	1,435	0,4930	4,7131	5,9797	4,9797	1,4	1,1	2,480	6,57949
2	0,986	1,0563	1,487	1,435	1,4790	14,2705	5,8149	4,8149	1,4	1,1	2,315	6,34623
3	0,986	1,0563	1,487	1,435	2,4650	24,2572	5,4703	4,4703	1,4	1,1	1,970	5,85866
4	0,986	1,0563	1,487	1,435	3,4510	35,1113	4,9082	3,9082	1,4	1,1	1,408	5,06342
5a	0,929	1,0563	1,487	1,435	4,4085	47,2861	4,0700	3,0700	1,4	1,1	0,570	3,6533
W TOTAL LAPISAN I+II+III												
5b	0,057	1,0563	1,487	1,435	4,9015	54,7773	3,4605	2,4605	1,4	1,061	0	0,17418
6a	0,569	1,0563	1,487	1,435	5,2145	60,3523	2,9680	1,9680	1,4	0,568	0	1,32203
W TOTAL LAPISAN I+II												
6b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,851	0	0	0,37464
W TOTAL LAPISAN I												

Tabel 5.2 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 90^0 dengan jumlah pias 6 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,700	F1	1,720	F2	1,724	F0	1,700	F1	1,720	F2	1,724
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,032	0,54083	4,60942	4,641	1,03049		1,03009		1,03003		4,50413		4,50586		4,50616	
0,032	1,56496	4,446	4,478	1,07074		1,06955		1,06935		4,18220		4,18685		4,18764	
0,032	2,40784	4,10443	4,136	1,08101		1,07903		1,07869		3,82649		3,83352		3,83472	
0,032	2,91333	3,5473	3,579	1,05501		1,05223		1,05176		3,39273		3,40168		3,40321	
0,030	2,68509	2,55941	2,590	0,98098		0,97743		0,97683		2,63981		2,64939		2,65103	
0,002	0,14233	0,13616	0,138	0,95219		0,94779		0,94704		0,14529		0,14596		0,14608	
0,022	1,14923	1,03345	1,055	0,89403		0,88935		0,88855		1,18030		1,18651		1,18757	
0,018	0,35643	0,19929	0,217	0,60565		0,60217		0,60157		0,35797		0,36004		0,36040	
	11,760									20,22891		20,26981		20,27680	

Tabel 5.3 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 90^0 dengan jumlah pias 6

titik	**koordinat**	
	X	**Y**
A	2	0
B	0	5
C	7,916	5
D	2,00	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	7,916
L CD	5,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COD	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	17,922
F	1,543

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,986	1,0563	1,487	1,435	0,4930	4,7131	5,9797	4,9797	1,4	1,1	2,480	6,57949	0,54083	6,55722
2	0,986	1,0563	1,487	1,435	1,4790	14,2705	5,8149	4,8149	1,4	1,1	2,315	6,34623	1,56496	6,15025
3	0,986	1,0563	1,487	1,435	2,4650	24,2572	5,4703	4,4703	1,4	1,1	1,970	5,85866	2,40784	5,34099
4	0,986	1,0563	1,487	1,435	3,4510	35,1113	4,9082	3,9082	1,4	1,1	1,408	5,06342	2,91333	4,14134
5a	0,929	1,0563	1,487	1,435	4,4085	47,2861	4,0700	3,0700	1,4	1,1	0,570	3,6533	2,68509	2,47728
W TOTAL LAPISAN I+II+III														24,6671
5b	0,057	1,0563	1,487	1,435	4,9015	54,7773	3,4605	2,4605	1,4	1,061	0	0,17418	0,14233	0,10041
6a	0,569	1,0563	1,487	1,435	5,2145	60,3523	2,9680	1,9680	1,4	0,568	0	1,32203	1,14923	0,65348
W TOTAL LAPISAN I+II														0,75388
6b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,851	0	0	0,37464	0,35643	0,11537
W TOTAL LAPISAN I													11,76	0,11537

Tabel 5.4 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 90^0 dengan jumlah pias 8

titik	koordinat	
	X	Y
A	2	0
B	0	5
C	7,916	5
D	2,00	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	7,916
L CD	5,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COD	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,620
F1	1,622
F2	1,623
F3	1,623

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,7395	1,0563	1,487	1,435	0,36975	3,5331	5,9886	5,905	1,4	1,1	3,405	5,9162
2	0,7395	1,0563	1,487	1,435	1,10925	10,6538	5,8966	5,813	1,4	1,1	3,313	5,8185
3	0,7395	1,0563	1,487	1,435	1,84875	17,9463	5,7081	5,624	1,4	1,1	3,124	5,6185
4	0,7395	1,0563	1,487	1,435	2,58825	25,5549	5,4130	5,329	1,4	1,1	2,829	5,3054
5	0,7395	1,0563	1,487	1,435	3,32775	33,6849	4,9926	4,909	1,4	1,1	2,409	4,8592
6	0,7395	1,0563	1,487	1,435	4,06725	42,6778	4,4111	4,327	1,4	1,1	1,827	4,2421
7a	0,436	1,0563	1,487	1,435	4,655	50,8806	3,7856	4,327	1,4	1,1	1,827	2,5011
W TOTAL LAPISAN I+II+III												
7b	0,3025	1,0563	1,487	1,435	5,02425	56,864	3,2798	3,196	1,4	1,796	0	1,2551
8a	0,3225	1,0563	1,487	1,435	5,33675	62,8053	2,7421	2,658	1,4	1,796	0	1,3381
W TOTAL LAPISAN I+II												
8b	0,417	1,0563	1,487	1,435	5,7065	72,005	1,8536	1,770	1,770	0	0	0,7795
W TOTAL LAPISAN I												

Tabel 5.4 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 90^0 dengan jumlah pias 8 (lanjutan)

cxB	W sin θ	W tg φ	13+15	Mi (t/m)			16/17 (t/m)		
(t/m)	(t/m)	(t/m)	(t/m)	F0 1,620	F1 1,622	F2 1,623	F0 1,620	F1 1,622	F2 1,623
13	14	15	16	17a	17b	17c	18a	18b	18c
0,024	0,36473	4,14472	4,169	1,02476	1,02472	1,02472	4,06803	4,06818	4,06820
0,024	1,07613	4,0763	4,100	1,06273	1,06262	1,06260	3,85830	3,85870	3,85878
0,024	1,73187	3,93617	3,960	1,08461	1,08443	1,08439	3,65127	3,65188	3,65200
0,024	2,28947	3,71682	3,741	1,08871	1,08846	1,08841	3,43603	3,43683	3,43699
0,024	2,69601	3,40426	3,428	1,07190	1,07158	1,07151	3,19832	3,19930	3,19949
0,024	2,87656	2,97192	2,996	1,02822	1,02782	1,02774	2,91373	2,91487	2,91508
0,014	1,941	1,75221	1,766	0,96627	0,96581	0,96572	1,82804	1,82890	1,82907

0,012	1,0513	0,98117	0,993	0,95047	0,94992	0,94981	1,04448	1,04508	1,04520
0,012	1,19048	1,04604	1,058	0,88592	0,88533	0,88522	1,19466	1,19545	1,19561
0,018	0,7415	0,41467	0,432	0,62081	0,62039	0,62030	0,69615	0,69663	0,69672
	15,9591						25,88902	25,89583	25,89714

Tabel 5.5 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 90^0 dengan jumlah pias 8

titik	koordinat	
	X	Y
A	2	0
B	0	5
C	7,916	5
D	2,00	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	7,916
L CD	5,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COD	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	17,898
F	1,548

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,7395	1,0563	1,487	1,435	0,36975	3,5331	5,9886	4,989	1,4	1,1	2,489	4,9440	0,3048	4,9346
2	0,7395	1,0563	1,487	1,435	1,10925	10,6538	5,8966	4,897	1,4	1,1	2,397	4,8464	0,89633	4,7628
3	0,7395	1,0563	1,487	1,435	1,84875	17,9463	5,7081	4,708	1,4	1,1	2,208	4,6464	1,43222	4,4201
4	0,7395	1,0563	1,487	1,435	2,58825	25,5549	5,4130	4,413	1,4	1,1	1,913	4,3333	1,86997	3,9090
5	0,7395	1,0563	1,487	1,435	3,32775	33,6849	4,9926	3,993	1,4	1,1	1,493	3,8871	2,15665	3,2340
6	0,7395	1,0563	1,487	1,435	4,06725	42,6778	4,4111	3,411	1,4	1,1	0,911	3,2700	2,21737	2,4034

7a	0,436	1,0563	1,487	1,435	4,655	50,8806	3,7856	2,786	1,4	1,1	0,286	1,5366	1,19252	0,9691
W TOTAL LAPISAN I+II+III														24,6330
7b	0,3035	1,0563	1,487	1,435	5,02475	56,8727	3,2790	2,279	1,4	0,879	0	0,8455	0,70827	0,4618
8a	0,3225	1,0563	1,487	1,435	5,33775	62,8262	2,7402	1,740	1,4	0,340	0	0,6400	0,56953	0,2921
W TOTAL LAPISAN I+II														0,7538
8b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,851	0,851	0	0	0,3746	0,35643	0,1154
W TOTAL LAPISAN I													11,7041	0,1154

Tabel 5.6 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 90^0 dengan jumlah pias 10

titik	koordinat	
	X	Y
A	2	0
B	0	5
C	7,916	5
D	2,00	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	7,916
L CD	5,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COD	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,800
F1	1,708
F2	1,717
F3	1,727

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,5916	1,0563	1,487	1,435	0,2958	2,82583	5,9927	5,909	1,4	1,1	3,409	4,7364
2	0,5916	1,0563	1,487	1,435	0,8874	8,50525	5,93401	5,850	1,4	1,1	3,350	4,6866
3	0,5916	1,0563	1,487	1,435	1,479	14,2705	5,81486	5,731	1,4	1,1	3,231	4,5854
4	0,5916	1,0563	1,487	1,435	2,0706	20,1879	5,6314	5,547	1,4	1,1	3,047	4,4297

0,01751	0,74034	0,4139	0,431	0,58911	0,74334	0,60274	0,73239	0,58043	0,71583
	14,768						25,22588	25,35394	25,51062

Tabel 5.7 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 90^0 dengan jumlah pias 10

titik	koordinat	
	X	Y
A	2	0
B	0	5
C	7,916	5
D	2,00	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	7,916
L CD	5,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COD	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	17,957
F	1,506

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,5916	1,0563	1,487	1,435	0,2958	2,82583	5,9927	4,993	1,4	1,1	2,493	3,95872	0,1952	3,95391
2	0,5916	1,0563	1,487	1,435	0,8874	8,50525	5,93401	4,934	1,4	1,1	2,434	3,9089	0,5781	3,86591
3	0,5916	1,0563	1,487	1,435	1,479	14,2705	5,81486	4,815	1,4	1,1	2,315	3,80774	0,9386	3,69024
4	0,5916	1,0563	1,487	1,435	2,0706	20,1879	5,6314	4,631	1,4	1,1	2,131	3,65199	1,2603	3,42763
5	0,5916	1,0563	1,487	1,435	2,6622	26,3402	5,37705	4,377	1,4	1,1	1,877	3,43607	1,5246	3,07932
6	0,5916	1,0563	1,487	1,435	3,2538	32,8403	5,04111	4,041	1,4	1,1	1,541	3,15087	1,7087	2,64731
7	0,5916	1,0563	1,487	1,435	3,8454	39,859	4,60575	3,606	1,4	1,1	1,106	2,78127	1,7825	2,13497
8	0,5916	1,0563	1,487	1,435	4,437	47,6888	4,03894	3,039	1,4	1,1	0,539	2,30008	1,7009	1,54831
9a	0,1402	1,0563	1,487	1,435	4,8029	53,1763	3,59613	2,596	1,4	1,1	0,096	0,456	0,3650	0,2733

5	0,5916	1,0563	1,487	1,435	2,6622	26,3402	5,37705	5,293	1,4	1,1	2,793	4,2138
6	0,5916	1,0563	1,487	1,435	3,2538	32,8403	5,04111	4,957	1,4	1,1	2,457	3,9286
7	0,5916	1,0563	1,487	1,435	3,8454	39,859	4,60575	4,522	1,4	1,1	2,022	3,5590
8	0,5916	1,0563	1,487	1,435	4,437	47,6883	4,03894	3,955	1,4	1,1	1,455	3,0778
9a	0,1402	1,0563	1,487	1,435	4,8029	53,1763	3,59613	3,512	1,4	1,1	1,012	0,6403
W TOTAL LAPISAN I+II+III												
9b	0,4514	1,0563	1,487	1,435	4,9585	55,7324	3,37835	3,294	1,4	1,894	0	1,93914
10a	0,1746	1,0563	1,487	1,435	5,4117	64,4156	2,59104	1,591	1,4	0,191	0	0,3078
W TOTAL LAPISAN I+II												
10b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,85053	0,851	1,767	0	0	0,77815
W TOTAL LAPISAN I												

Tabel 5.6 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 90^0 dengan jumlah pias 10 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,800	F1	1,708	F2	1,717	F0	1,800	F1	1,708	F2	1,708
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,019	0,2336	3,31822	3,337	1,01798		1,01901		1,01891		3,27850		3,27518		3,27551	
0,019	0,69342	3,28331	3,303	1,04658		1,04968		1,04937		3,15555		3,14624		3,14716	
0,019	1,13076	3,21244	3,232	1,06510		1,07026		1,06975		3,03416		3,01952		3,02097	
0,019	1,52928	3,10333	3,123	1,07288		1,08011		1,07940		2,91043		2,89096		2,89287	
0,019	1,87035	2,95206	2,971	1,06885		1,07814		1,07722		2,77989		2,75594		2,75829	
0,019	2,13123	2,75225	2,771	1,05120		1,06256		1,06143		2,63649		2,60831		2,61107	
0,019	2,28171	2,49332	2,513	1,01697		1,03039		1,02906		2,47062		2,43844		2,44159	
0,019	2,27671	2,15621	2,175	0,96082		0,97630		0,97477		2,26416		2,22825		2,23176	
0,005	0,51269	0,44858	0,453	0,91070		0,92746		0,92580		0,49757		0,48858		0,48945	
0,017	1,60297	1,51586	1,533	0,92173		0,94104		0,93913		1,66331		1,62918		1,63250	
0,007	0,27768	0,24061	0,247	0,82322		0,84429		0,84221		0,30040		0,29290		0,29362	

6	0,493	1,0563	1,487	1,435	2,7115	26,8667	5,35236	4,352	1,4	1,1	1,852	4,6146
7	0,493	1,0563	1,487	1,435	3,2045	32,2818	5,07259	4,073	1,4	1,1	1,573	4,4166
8	0,493	1,0563	1,487	1,435	3,6975	38,0428	4,7253	3,725	1,4	1,1	1,225	4,1709
9	0,493	1,0563	1,487	1,435	4,1905	44,3001	4,29415	3,294	1,4	1,1	0,794	3,8659
10a	0,436	1,0563	1,487	1,435	4,655	50,8806	3,78563	2,786	1,4	1,1	0,286	3,1008
W TOTAL LAPISAN I+II+III												
10b	0,057	1,056	1,487	1,435	4,9015	54,7773	3,46053	2,461	1,4	1,061	0	0,37542
11	0,493	1,056	1,487	1,435	5,1765	59,6268	3,03378	2,034	1,4	0,634	0	2,63228
12a	0,076	1,056	1,487	1,435	5,461	65,5284	2,48545	1,485	1,4	0,085	0	0,28402
W TOTAL LAPISAN I+II												
12b	0,417	1,056	1,487	1,435	5,7075	72,0359	1,85053	0,851	0,851	0	0	0,88348
W TOTAL LAPISAN I												

Tabel 5.8 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 90^0 dengan jumlah pias 12 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,600	F1	1,589	F2	1,587	F0	1,600	F1	1,589	F2	1,587
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,016	0,20834	3,55131	3,567	1,01715		1,01727		1,01729		3,50719		3,50677		3,50669	
0,016	0,62147	3,53115	3,547	1,04636		1,04672		1,04679		3,39002		3,38885		3,38863	
0,016	1,02384	3,49041	3,506	1,06864		1,06924		1,06936		3,28122		3,27937		3,27901	
0,016	1,40782	3,4282	3,444	1,08369		1,08453		1,08470		3,17823		3,17576		3,17528	
0,016	2,08617	3,23284	3,249	1,08992		1,09125		1,09151		2,98081		2,97720		2,97649	
0,016	2,08617	3,23284	3,249	1,08992		1,09125		1,09151		2,98081		2,97720		2,97649	
0,016	2,3597	3,09418	3,110	1,07925		1,08081		1,08112		2,88182		2,87765		2,87684	
0,016	2,57122	2,92205	2,938	1,05731		1,05911		1,05947		2,77883		2,77409		2,77317	
0,016	2,70088	2,70836	2,724	1,02138		1,02343		1,02382		2,66736		2,66203		2,66099	
0,014	2,40639	2,17233	2,187	0,97046		0,97274		0,97318		2,25304		2,24778		2,24676	

7	0,493	1,0563	1,487	1,435	3,2045	32,2818	5,07259	4,073	1,4	1,1	1,573	4,41663	2,3597	3,73343
8	0,493	1,0563	1,487	1,435	3,6975	38,0428	4,7253	3,725	1,4	1,1	1,225	4,17094	2,57122	3,28414
9	0,493	1,0563	1,487	1,435	4,1905	44,3001	4,29415	3,294	1,4	1,1	0,794	3,86592	2,70088	2,76597
10a	0,436	1,0563	1,487	1,435	4,655	50,8806	3,78563	2,786	1,4	1,1	0,286	3,10079	2,40639	1,95554
W TOTAL LAPISAN I+II+III														39,9178
10b	0,057	1,056	1,487	1,435	4,9015	54,7773	3,46053	2,461	1,4	1,061	0	0,37542	0,30677	0,21641
11	0,493	1,056	1,487	1,435	5,1765	59,6268	3,03378	2,034	1,4	0,634	0	2,63228	2,27156	1,33001
12a	0,076	1,056	1,487	1,435	5,461	65,5284	2,48545	1,485	1,4	0,085	0	0,28402	0,25856	0,11753
W TOTAL LAPISAN I+II														1,54642
12b	0,417	1,056	1,487	1,435	5,7075	72,0359	1,85053	0,851	0,851	0	0	0,88348	0,84055	0,27206
W TOTAL LAPISAN I													20,5698	0,27206

Tabel 5.10 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 90^0 dengan jumlah pias 14

titik	koordinat	
	X	Y
A	2	0
B	0	5
C	7,916	5
D	2,00	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	7,916
L CD	5,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COD	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,800
F1	1,748
F2	1,739
F3	1,737

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12

0,014	0,83856	1,85279	1,867	1,07181	1,07550	1,07616	1,74147	1,73550	1,73442
0,014	0,98749	1,78518	1,799	1,07269	1,07720	1,07801	1,67702	1,66999	1,66873
0,014	1,11225	1,70139	1,715	1,06721	1,07254	1,07350	1,60711	1,59912	1,59769
0,014	1,20652	1,59953	1,613	1,05464	1,06080	1,06190	1,52968	1,52081	1,51922
0,014	1,26255	1,47691	1,491	1,03392	1,04090	1,04215	1,44174	1,43208	1,43035
0,014	1,27022	1,3295	1,343	1,00347	1,01126	1,01267	1,33859	1,32828	1,32643
0,014	1,21532	1,15092	1,165	0,96078	0,96939	0,97094	1,21220	1,20143	1,19951
0,007	0,59348	0,52385	0,531	0,91723	0,92647	0,92814	0,57907	0,57330	0,57227
0,008	0,47706	0,44991	0,457	0,91937	0,93014	0,93208	0,49761	0,49185	0,49082
0,016	0,79672	0,70723	0,723	0,85626	0,86770	0,86976	0,84483	0,83370	0,83172
0,000	0,00709	0,00412	0,004	0,79852	0,81042	0,81256	0,00543	0,00535	0,00533
0,018	0,74034	0,6083	0,626	0,58911	0,59752	0,59904	1,06228	1,04733	1,04468
	12,0642						21,08489	20,97506	20,95545

Tabel 5.11 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 90^0 dengan jumlah pias 14

titik	koordinat	
	X	Y
A	2	0
B	0	5
C	7,916	5
D	2,00	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	7,916
L CD	5,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COD	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	17,877
F	1,551

W TOTAL LAPISAN I+II+III														24,6209
9b	0,4514	1,0563	1,487	1,435	5,0987	58,1881	3,16279	2,163	1,4	0,763	0	1,17955	1,0024	0,62178
10a	0,1746	1,0563	1,487	1,435	5,4117	64,4156	2,59104	1,591	1,4	0,191	0	0,3078	0,2776	0,13292
W TOTAL LAPISAN I+II														0,7547
10b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,85053	0,851	1,767	0	0	0,77815	0,7402	0,240
W TOTAL LAPISAN I													12,0741	0,240

Tabel 5.8 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 90^0 dengan jumlah pias 12

titik	koordinat	
	X	Y
A	2	0
B	0	5
C	7,916	5
D	2,00	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	7,916
L CD	5,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COD	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,600
F1	1,589
F2	1,587
F3	1,587

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,493	1,0563	1,487	1,435	0,2465	2,35456	5,99493	4,995	1,4	1,1	2,495	5,0691
2	0,493	1,0563	1,487	1,435	0,7395	7,07971	5,95425	4,954	1,4	1,1	2,454	5,0404
3	0,493	1,0563	1,487	1,435	1,2325	11,8539	5,87205	4,872	1,4	1,1	2,372	4,9822
4	0,493	1,0563	1,487	1,435	1,7255	16,7133	5,74653	4,747	1,4	1,1	2,247	4,8934
5	0,493	1,0563	1,487	1,435	2,7115	26,8667	5,35236	4,352	1,4	1,1	1,852	4,6146

0,002	0,30677	0,26301	0,265	0,97567	0,97834	0,97886	0,27180	0,27106	0,27091
0,019	2,27156	1,84411	1,863	0,92689	0,92971	0,93026	2,00991	2,00382	2,00263
0,002	0,25856	0,00021	0,002	0,85860	0,86157	0,86215	0,00270	0,00269	0,00269
0,018	0,84055	0,61894	0,636	0,62426	0,62638	0,62679	1,01954	1,01610	1,01543
	20,8909						33,20330	33,16036	33,15201

Tabel 5.9 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 90^0 dengan jumlah pias 12

titik	koordinat	
	X	Y
A	2	0
B	0	5
C	7,916	5
D	2,00	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	7,916
L CD	5,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COD	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	29,304
F	1,436

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,493	1,0563	1,487	1,435	0,2465	2,35456	5,99493	4,995	1,4	1,1	2,495	5,06915	0,20834	5,06487
2	0,493	1,0563	1,487	1,435	0,7395	7,07971	5,95425	4,954	1,4	1,1	2,454	5,04037	0,62147	5,00191
3	0,493	1,0563	1,487	1,435	1,2325	11,8539	5,87205	4,872	1,4	1,1	2,372	4,98221	1,02384	4,87588
4	0,493	1,0563	1,487	1,435	1,7255	16,7133	5,74653	4,747	1,4	1,1	2,247	4,89342	1,40782	4,68653
5	0,493	1,0563	1,487	1,435	2,2185	21,7002	5,57479	4,575	1,4	1,1	2,075	4,77191	1,76509	4,43347
6	0,493	1,0563	1,487	1,435	2,7115	26,8667	5,35236	4,352	1,4	1,1	1,852	4,61456	2,08617	4,11607

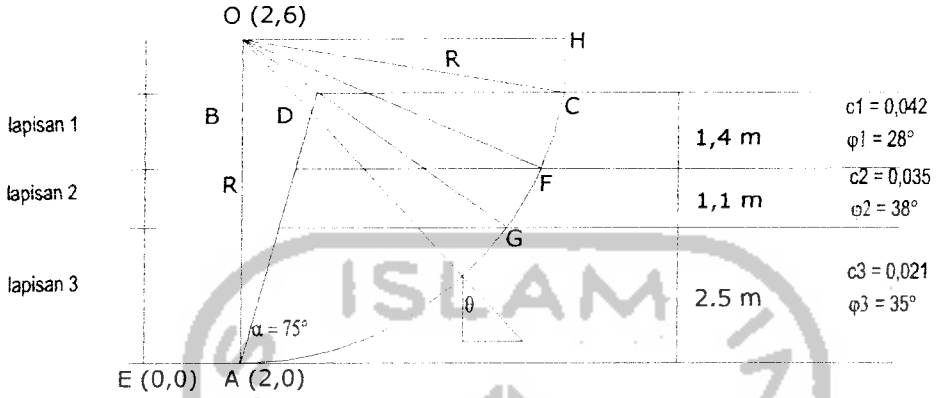
1	0,4226	1,0563	1,487	1,435	0,2113	2,0182	5,9963	4,9963	1,4	1,1	2,496	2,83002
2	0,4226	1,0563	1,487	1,435	0,6339	6,0646	5,9664	4,9664	1,4	1,1	2,466	2,81191
3	0,4226	1,0563	1,487	1,435	1,0565	10,1417	5,9063	4,9063	1,4	1,1	2,406	2,77542
4	0,4226	1,0563	1,487	1,435	1,4791	14,2715	5,8148	4,8148	1,4	1,1	2,315	2,71998
5	0,4226	1,0563	1,487	1,435	1,9017	18,4786	5,6907	4,6907	1,4	1,1	2,191	2,64468
6	0,4226	1,0563	1,487	1,435	2,3243	22,7918	5,5315	4,5315	1,4	1,1	2,032	2,54817
7	0,4226	1,0563	1,487	1,435	2,7469	27,2463	5,3343	4,3343	1,4	1,1	1,834	2,42856
8	0,4226	1,0563	1,487	1,435	3,1695	31,8873	5,0945	4,0945	1,4	1,1	1,595	2,28317
9	0,4226	1,0563	1,487	1,435	3,5921	36,7757	4,8059	3,8059	1,4	1,1	1,306	2,10814
10	0,4226	1,0563	1,487	1,435	4,0147	41,9989	4,4589	3,4589	1,4	1,1	0,959	1,89773
11	0,4226	1,0563	1,487	1,435	4,4373	47,6931	4,0386	3,0386	1,4	1,1	0,539	1,64283
12a	0,2244	1,0563	1,487	1,435	4,7608	52,5107	3,6517	2,6517	1,4	1,1	0,152	0,74774
W TOTAL LAPISAN I+II+III												
12b	0,1982	1,0563	1,487	1,435	4,9721	55,9637	3,3583	2,3583	1,4	0,958	0	0,57554
13	0,4226	1,0563	1,487	1,435	5,2825	61,6927	2,8452	1,8452	1,4	0,445	0	0,90472
14a	0,0052	1,0563	1,487	1,435	5,4964	66,3577	2,4062	1,4062	1,4	0,006	0	0,00774
W TOTAL LAPISAN I+II												
14b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	1,767	0	0	0,77815
W TOTAL LAPISAN I												

Tabel 5.10 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 90^0 dengan jumlah pias 14 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,800	F1	1,748	F2	1,739	F0	1,800	F1	1,748	F2	1,739
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,014	0,0997	1,98264	1,996	1,01309		1,01350		1,01358		1,97057		1,96978		1,96963	
0,014	0,2972	1,96995	1,984	1,03554		1,03677		1,03699		1,91561		1,91334		1,91293	
0,014	0,4889	1,94439	1,958	1,05292		1,05497		1,05534		1,85970		1,85609		1,85544	
0,014	0,67079	1,90555	1,919	1,06510		1,06797		1,06849		1,80198		1,79713		1,79626	

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,4226	1,0563	1,487	1,435	0,2113	2,0182	5,9963	4,9963	1,4	1,1	2,496	2,83002	0,0997	2,8283
2	0,4226	1,0563	1,487	1,435	0,6339	6,0646	5,9664	4,9664	1,4	1,1	2,466	2,81191	0,2972	2,7962
3	0,4226	1,0563	1,487	1,435	1,0565	10,1417	5,9063	4,9063	1,4	1,1	2,406	2,77542	0,4889	2,7320
4	0,4226	1,0563	1,487	1,435	1,4791	14,2715	5,8148	4,8148	1,4	1,1	2,315	2,71998	0,67079	2,6360
5	0,4226	1,0563	1,487	1,435	1,9017	18,4786	5,6907	4,6907	1,4	1,1	2,191	2,64468	0,83856	2,5082
6	0,4226	1,0563	1,487	1,435	2,3243	22,7918	5,5315	4,5315	1,4	1,1	2,032	2,54817	0,98749	2,3490
7	0,4226	1,0563	1,487	1,435	2,7469	27,2463	5,3343	4,3343	1,4	1,1	1,834	2,42856	1,11225	2,1589
8	0,4226	1,0563	1,487	1,435	3,1695	31,8873	5,0945	4,0945	1,4	1,1	1,595	2,28317	1,20652	1,9383
9	0,4226	1,0563	1,487	1,435	3,5921	36,7757	4,8059	3,8059	1,4	1,1	1,306	2,10814	1,26255	1,6883
10	0,4226	1,0563	1,487	1,435	4,0147	41,9989	4,4589	3,4589	1,4	1,1	0,959	1,89773	1,27022	1,4099
11	0,4226	1,0563	1,487	1,435	4,4373	47,6931	4,0386	3,0386	1,4	1,1	0,539	1,64283	1,21532	1,1054
12a	0,2244	1,0563	1,487	1,435	4,7608	52,5107	3,6517	2,6517	1,4	1,1	0,152	0,74774	0,59348	0,4549
W TOTAL LAPISAN I+II+III														24,6054
12b	0,1982	1,0563	1,487	1,435	4,9721	55,9637	3,3583	2,3583	1,4	0,958	0	0,57554	0,47706	0,3220
13	0,4226	1,0563	1,487	1,435	5,2825	61,6927	2,8452	1,8452	1,4	0,445	0	0,90472	0,79672	0,4287
14a	0,0052	1,0563	1,487	1,435	5,4964	66,3577	2,4062	1,4062	1,4	0,006	1	0,0152	0,01393	0,0061
W TOTAL LAPISAN I+II														0,7506
14b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,851	0	0	0,37464	0,35643	0,1154
W TOTAL LAPISAN I													11,6732	0,1154

5.3 Perhitungan Untuk Sudut Kemiringan 75^0



Gambar 5.3 Koordinat dan bidang longsor pada sudut 75^0

Hitungan stabilitas lereng dengan sudut 75^0 dan jumlah pias 6.

Menentukan koordinat awal, titik A = (2,0) dan O = (2,6).

Koordinat E = (0,0); koordinat B didapat (2,5).

Panjang OB = L$\overline{OB}$ = 1 m, L$\overline{OA}$ = R = 6 m.

$$L\overline{BC} = \sqrt{L\overline{OA}^2 - L\overline{OB}^2} = \sqrt{6^2 - 1^2} = 5{,}916 \text{ m}.$$

Koordinat C (XC,YC):

XC = L$\overline{BC}$ = 5,916 + 2 = 7,916 m ; YC = 5,0 m.

Jadi koordinat C (7,916;5).

Koordinat D (XD,YD)

YD = 5

$$XD = \frac{YD}{\tan\alpha} + 2 = \frac{5}{\tan 75} + 2 = 3{,}340$$

Jadi koordinat D (3,340;5).

$\angle FOG$ $= 2 \text{ x arc sin} \left(\frac{\left(\sqrt{(XF - XG)^2 + (YF - YG)^2} / 2 \right)}{R} \right)$ $= 12{,}107^0.$

$\angle GOA$ $= \text{arc sin} \left(\frac{\left(\sqrt{(XG - XA)^2 + (YG - YA)^2} \ 2 \right)}{R} \right)$ $= 54{,}315^0.$

$L\overline{CF}$ $= \frac{\angle COF}{360}$ x 2π x R $= 1{,}464$ m.

$L\overline{FG}$ $= \frac{\angle COF}{360}$ x 2π x R $= 1{,}268$ m.

$L\overline{GA}$ $= \frac{\angle COF}{360}$ x 2π x R $= 5{,}688$ m.

$\varphi_1 = 28$; $\varphi_2 = 38$; $\varphi_3 = 35$.

$c_1 = 0{,}042$; $C_2 = 0{,}035$; $C_3 = 0{,}021$.

Lebar tiap pias $= \frac{L\overline{CD}}{6} = 0{,}986$ m.

Hitungan untuk pias 1a dengan metode Bishop:

$x_1a = ½ \text{ x } B_1a = ½ \text{ x } 0{,}670 = 0{,}3349$ m.

$\theta_1a = \text{arc sin} \frac{x_1 a}{R} = 3{,}2001^0.$

$y_1a = \frac{x_1 a}{\tan \theta_1 a} = 5{,}9906$ m.

$h_1a = (x_1a \tan \alpha) - (L\overline{OE} - y_1a) = 1{,}2406$ m.

$W = (B_{1a} \text{ x } h_1 \text{ x } \gamma_1) + (B_{1a} \text{ x } h_2 \text{ x } \gamma_2) + (B_{1a} \text{ x } h_3 \text{ x } \gamma_3)$

$= (0{,}670 \text{ x } 0 \text{ x } 1{,}0563) + (0{,}670 \text{ x } 0 \text{ x } 1{,}487) + (0{,}670 \text{ x } 1{,}2406 \text{ x } 1{,}435)$

$= 1{,}1926$ t/m

$C_r \text{ x } B_1 = C_3 \text{ x } B_{1a} = 0{,}0141$ t/m.

$W \sin \theta_{1a}$ $= 1{,}1926 \sin (3{,}2001^0) = 0{,}0666$ t/m.

$W \tan \varphi_3$ $= 1{,}1926 \tan 35^0 = 0{,}8355$ t/m.

$(c_1 \times B_{1a}) + W \tan \varphi_3 = 0{,}850$ t/m.

Untuk mencari F dilakukan dengan iterasi yang berulang (trial and error).

Dicari M dengan F coba-coba,

F_0 $= 1{,}500$ didapat M_1 pada lapis 1 $= 1{,}02452$

$((c_1 \times B_{1a}) + W \tan \varphi_3)/ M_{1a} = 0{,}82923$ (pada lapis 1a).

F_1 $= (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_1)/(\Sigma W \sin \theta_1) = 1{,}476.$

Dari F_1 didapat $M_2 = 1{,}02495$ (pada lapis 1a)

$((c_1 \times B_1) + W \tan \varphi_3)/ M_2 = 0{,}82888.$

F_2 $= (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_2)/ (\Sigma W \sin \theta_1) = 1{,}471.$

Dari F_2 didapat $M_3 = 1.02504.$

$((c_1 \times B_1) + W \tan \varphi_3)/ M_3 = 0.82881.$

F_3 $= (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_3)/ (\Sigma W \sin \theta_1) = 1{,}469.$

Karena nilai F_3 mendekati F_2, iterasi dihentikan dan didapat nilai F =1,469.

Hitungan untuk pias ke 1 dengan metode Fellinius:

X_1a $= \frac{1}{2} \times B_1a$ $= \frac{1}{2} \times 0,$ $= 0{,}493$ m.

x_1a $= \frac{1}{2} \times B_1a$ $= \frac{1}{2} \times 0{,}670$ $= 0{,}3349$ m.

θ_1a $= \text{arc sin } \frac{x_1a}{R} = 3{,}2001^0.$

y_1a $= \frac{x_1a}{\tan \theta 1a} = 5{,}9906$ m.

h_1a $= (x_1a \tan \alpha) - (L\overline{OE} - y_1a) = 1{,}2406$ m.

W $= (B_{1a} \times h_1 \times \gamma_1) + (B_{1a} \times h_2 \times \gamma_2) + (B_{1a} \times h_3 \times \gamma_3)$

$L\overline{CD}$ = XC – XD = 5,916 – 1,340 = 4,576 m.

Koordinat E didapat: (0,0).

$L\overline{OB}$ = YO – YB = 6 – 5 = 1 m.

$L\overline{OC}$ = R $= \sqrt{(XA-XO)^2+(YA-YO)^2}$ $= \sqrt{(2-2)^2+(0-6)^2}$ = 6 m.

$L\overline{OA}$ = R = 6 m

$L\overline{OE}$ = YO – YE = 6 - 0 = 6 m

$L\overline{EA}$ = XA – XE = 2 – 0 = 2 m.

Koordinat F:

XF $= \sqrt{\left(L\overline{OA}\right)^2+\left(L\overline{OE}-YF\right)^2}+2$ $= \sqrt{(6)^2+(6-3{,}6)^2}+2$ = 7,499 m.

YF = $H_2 + H_3$ =2,5 + 1,1 = 3,6 m.

Jadi koordinat F: (7,499;3,6).

Koordinat G:

XG $= \sqrt{\left(L\overline{OA}\right)^2+\left(L\overline{OE}-YG\right)^2}+2$ $= \sqrt{(6)^2+(6-2{,}5)^2}+2$ = 6,873 m.

YG = H_3 =2,5 m.

Jadi koordinat G: (6,873;2,5).

Koordinat H: (XC + 2,YO) = (7,916;6).

$\angle$COB = arc tan $\frac{L\overline{BC}}{L\overline{OB}}$ = arc tan $\frac{6}{1}$ = $80{,}406^0$.

$\angle$AOC = $80{,}406^0$.

$\angle$COF = 2 x arc sin $\left(\frac{\left(\sqrt{(XC-XF)^2+(YC-YF)^2}/2\right)}{R}\right)$ = $13{,}984^0$.

= (0,670 x 0 x 1,0563) +(0,670 x0 x 1,487) + (0,670 x 1,2406 x 1,435)

= 1,1926 t/m.

$W \sin \theta_{1a}$ = 1,1926 sin (3,2001^0) = 0.0666 t/m.

$W \cos \theta_{1a}$ = 1,1926 cos (3,2001^0) = 1.1815 t/m.

$\Sigma W \sin \theta$ = 11.4201 t/m.

$\Sigma W \cos \theta$ untuk lap. III = 1.1815 t/m.

$\Sigma W \cos \theta$ untuk lap. II + III = 1.2578 t/m.

$\Sigma W \cos \theta$ untuk lap. I + II + III = 16.7133 t/m.

$\Sigma W \cos \theta$ untuk lap. I + II = 0.6544 t/m.

$\Sigma W \cos \theta$ untuk lap. I = 0.3752 t/m.

$L\overline{AC} \times c = (L\overline{CF} \times c_1) + (L\overline{FG} \times c_2) + (L\overline{GA} \times c_3) = 0{,}225$ m.

$W \cos \theta \times \tan \varphi$ = (1,1815 x 35,000) + (1,2578 x 35,000) + (16,7133 x 35,000) +

(0.6544 x 38,000) + (0.3752 x 28,000)

= 14,122 t/m.

$F = ((L\overline{AC} \times c) + (W \cos \theta \times \tan \varphi))/(\Sigma W \sin \theta)$

= (0,225 + 14,122)/11,4201

= 1,256.

4	0,740	1,0563	1,478	1,435	2,5791	25,4583	5,4174	4,417	1,4	1,1	1,9174	4,3306
5	0,740	1,0563	1,478	1,435	3,3186	33,5802	4,9987	3,999	1,4	1,1	1,4987	3,8862
6	0,740	1,0563	1,487	1,435	4,0581	42,5594	4,4195	3,419	1,4	1,1	0,9195	3,2789
7a	0,436	1,0563	1,487	1,435	4,6459	50,7427	3,7968	2,797	1,4	1,1	0,2968	1,5436
W TOTAL LAPISAN I+II+III												
7b	0,304	1,0563	1,487	1,435	5,0156	56,7135	3,2930	2,293	1,4	0,893	0	0,8518
8a	0,333	1,0563	1,487	1,435	5,3339	62,7452	2,7477	1,748	1,4	0,348	0	0,6646
W TOTAL LAPISAN I+II												
8b	0,417	1,0563	1,487	1,435	5,7089	72,0784	1,8463	0,846	0,846	0	0	0,3728
W TOTAL LAPISAN I												

Tabel 5.14 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 75^0 dengan jumlah pias 8 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,500	F1	1,482	F2	1,479	F0	1,500	F1	1,482	F2	1,479
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0141	0,0666	0,8355	0,850	1,02452		1,02484		1,02790		0,82923		0,82897		0,82651	
0,0019	0,0304	0,18116	0,183	1,04795		1,04861		1,04874		0,17472		0,17460		0,17458	
0,0063	0,1445	0,71274	0,719	1,05621		1,05702		1,05717		0,68074		0,68022		0,68012	
0,0122	0,4181	1,52465	1,537	1,07111		1,07219		1,07241		1,43481		1,43336		1,43307	
0,0042	0,1968	0,58859	0,593	1,08158		1,08291		1,08316		0,54810		0,54743		0,54729	
0,0240	1,4261	3,25731	3,281	1,09505		1,09679		1,09713		2,99651		2,99177		2,99085	
0,0240	1,8622	3,03388	3,058	1,10366		1,10609		1,10657		2,77071		2,76461		2,76342	
0,0240	2,1503	2,72259	2,747	1,09140		1,09453		1,09514		2,51661		2,50941		2,50801	
0,0240	2,2184	2,29712	2,321	1,05237		1,05620		1,05695		2,20564		2,19765		2,19609	
0,0142	1,1956	1,08144	1,096	0,99428		0,99866		0,99952		1,10191		1,09708		1,09614	

Tabel 5.12 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 75^0 dengan jumlah pias 6

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	3,34	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	4,576
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,500
F1	1,476
F2	1,471
F3	1,469

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1a	0,670	1,0563	1,487	1,435	0,3349	3,2001	5,9906	1,2406	0	0	1,2406	1,1926
W TOTAL LAPISAN III												
1b	0,295	1,0563	1,487	1,435	0,8172	7,8284	5,9441	2,9940	0	0,550	2,4441	1,2747
W TOTAL LAPISAN II+III												
1c	0,021	1,0563	1,487	1,435	0,9751	9,3530	5,9202	3,5594	0,039	1,1	2,4202	0,1082
2a	0,375	1,0563	1,487	1,435	1,1731	11,2749	5,8842	4,2623	0,778	1,1	2,3841	2,2046
2b	0,611	1,0563	1,487	1,435	1,6661	16,1220	5,7640	4,7640	1,4	1,1	2,2640	3,8880
3	0,986	1,0563	1,478	1,435	2,4646	24,2530	5,4704	4,4704	1,4	1,1	1,9704	5,8492
4	0,986	1,0563	1,487	1,435	3,4506	35,1066	4,9085	3,9085	1,4	1,1	1,4085	5,0638
5a	0,929	1,0563	1,487	1,435	4,4081	47,2805	4,0705	3,0705	1,4	1,1	0,5705	3,6539
W TOTAL LAPISAN I+II+III												
5b	0,057	1,0563	1,487	1,435	4,9011	54,7707	3,4611	2,4611	1,4	1,061	0	0,1742

6a	0,569	1,0563	1,487	1,435	5,1571	59,2624	3,0666	2,0666	1,4	0,667	0	1,4055
W TOTAL LAPISAN I+II												
6b	0,417	1,0563	1,487	1,435	5,7071	72,0235	1,8518	0,8518	0,852	0	0	0,3752
W TOTAL LAPISAN I												

Tabel 5.12 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 75^0 dengan jumlah pias 6 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,500	F1	1,476	F2	1,471	F0	1,500	F1	1,476	F2	1,471
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0141	0,0666	0,8355	0,850	1,02452		1,02495		1,02504		0,82923		0,82888		0,82881	
0,0082	0,1737	0,89303	0,901	1,05431		1,05536		1,05559		0,85479		0,85394		0,85375	
0,0007	0,0176	0,07577	0,076	1,06263		1,06388		1,06415		0,07194		0,07186		0,07184	
0,0122	0,4312	1,54447	1,557	1,07204		1,07354		1,07387		1,45206		1,45002		1,44959	
0,0199	1,0801	2,72386	2,744	1,09038		1,09252		1,09298		2,51629		2,51137		2,51031	
0,0320	2,4035	4,09777	4,130	1,10359		1,10675		1,10743		3,74216		3,73147		3,72918	
0,0320	2,9132	3,54758	3,580	1,08664		1,09106		1,09201		3,29423		3,28087		3,27801	
0,0302	2,6853	2,55981	2,590	1,02140		1,02705		1,02827		2,53573		2,52178		2,51879	
0,0022	0,1424	0,1362	0,138	1,00235		1,00936		1,01087		0,13805		0,13710		0,13689	
0,0218	1,2083	1,0987	1,120	0,95879		0,96617		0,96776		1,16862		1,15970		1,15780	
0,0175	0,3569	0,19958	0,217	0,64553		0,65108		0,65228		0,33631		0,33344		0,33283	
	11,4788									16,93940		16,88043		16,86779	

Tabel 5.13 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 75^0 dengan jumlah pias 6

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	3,34	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	4,576
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	14,122
F	1,256

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1a	0,670	1,0563	1,487	1,435	0,3349	3,2001	5,9906	1,2406	0	0	1,2406	1,1926	0,0666	1,1815
W TOTAL LAPISAN III														1,1815
1b	0,295	1,0563	1,487	1,435	0,8172	7,8284	5,9441	2,9940	0	0,5500	2,4441	1,2747	0,1737	1,2578
W TOTAL LAPISAN II+III														1,2578
1c	0,021	1,0563	1,487	1,435	0,9751	9,3530	5,9202	3,5594	0,03919	1,1	2,4202	0,1082	0,0176	0,1061
2a	0,375	1,0563	1,487	1,435	1,1731	11,2749	5,8842	4,2623	0,77813	1,1	2,3841	2,2046	0,4312	2,1179
2b	0,611	1,0563	1,487	1,435	1,6661	16,1220	5,7640	4,7640	1,4	1,1	2,2640	3,8880	1,0801	3,5449
3	0,986	1,0563	1,478	1,435	2,4646	24,2530	5,4704	4,4704	1,4	1,1	1,9704	5,8492	2,4035	4,7851
4	0,986	1,0563	1,487	1,435	3,4506	35,1066	4,9085	3,9085	1,4	1,1	1,4085	5,0638	2,9132	2,5055
5a	0,929	1,0563	1,487	1,435	4,4081	47,2805	4,0705	3,0705	1,4	1,1	0,5705	3,6539	2,6853	3,6539
W TOTAL LAPISAN I+II+III														16,7133
5b	0,057	1,0563	1,487	1,435	4,9011	54,7707	3,4611	2,4611	1,4	1,061	0	0,1742	0,1424	0,1005
6a	0,569	1,0563	1,487	1,435	5,2141	60,3446	2,9687	1,9687	1,4	0,569	0	1,3226	1,1497	0,6544

W TOTAL LAPISAN I+II														0,6544
6b	0,417	1,0563	1,487	1,435	5,7071	72,0235	1,8518	0,8518	0,852	0	0	0,3752	0,3569	0,3752
W TOTAL LAPISAN I													11,4201	0,3752

Tabel 5.14 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 75^0 dengan jumlah pias 8

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	3,34	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	4,576
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,500
F1	1,482
F2	1,479
F3	1,480

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1a	0,670	1,0563	1,487	1,435	0,3349	3,2001	5,9906	1,2406	0	0	1,2406	1,1926
W TOTAL LAPISAN III												
1b	0,070	1,0563	1,487	1,435	0,7046	6,7442	5,9585	2,5882	0	0,130	2,4585	0,2586
2a	0,226	1,0563	1,487	1,435	0,8521	8,1648	5,9392	3,1193	0	0,680	2,4392	1,0174
W TOTAL LAPISAN II+III												
2b	0,375	1,0563	1,487	1,435	1,1524	11,0731	5,8883	4,189	0,6998	1,1	2,3892	2,1763
2c	0,130	1,0563	1,487	1,435	1,4049	13,5412	5,8332	4,833	1,4	1,1	2,3332	0,8401
3	0,740	1,0563	1,487	1,435	1,8396	17,8547	5,7110	4,711	1,4	1,1	2,2110	4,6495

0,0116	0,7123	0,66588	0,677	0,98425	0,98425	0,94468	0,68833	0,68833	0,71716
0,0127	0,5910	0,51954	0,532	0,92095	0,92656	0,92766	0,57797	0,57446	0,57378
0,0088	0,3547	0,1983	0,207	0,64472	0,64881	0,64961	0,32116	0,31913	0,31874
	11,3670						16,84643	16,80703	16,82576

Tabel 5.15 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 75^0 dengan jumlah pias 8

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	3,34	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	4,576
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	14,927
F	1,333

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1a	0,670	1,0563	1,487	1,435	0,3349	3,2001	5,9906	1,2406	0	0	1,2406	1,1926	0,0666	1,1907
W TOTAL LAPISAN III														1,1907
1b	0,070	1,0563	1,487	1,435	0,7046	6,7442	5,9585	2,5882	0	0,130	2,4585	0,2586	0,0304	0,2568
2a	0,226	1,0563	1,487	1,435	0,8521	8,1648	5,9392	3,1193	0	0,680	2,4392	1,0174	0,1445	1,0071
W TOTAL LAPISAN II+III														1,2639
2b	0,375	1,0563	1,487	1,435	1,1524	11,0731	5,8883	4,189	0,6998	1,1	2,3892	2,1763	0,4181	2,1357
2c	0,130	1,0563	1,487	1,435	1,4049	13,5412	5,8332	4,833	1,4	1,1	2,3332	0,8401	0,1968	0,8168

3	0,740	1,0563	1,487	1,435	1,8396	17,8547	5,7110	4,711	1,4	1,1	2,2110	4,6495	1,4261	4,4254
4	0,740	1,0563	1,478	1,435	2,5791	25,4583	5,4174	4,417	1,4	1,1	1,9174	4,3306	1,8622	3,9097
5	0,740	1,0563	1,478	1,435	3,3186	33,5802	4,9987	3,999	1,4	1,1	1,4987	3,8862	2,1503	3,2372
6	0,740	1,0563	1,487	1,435	4,0581	42,5594	4,4195	3,419	1,4	1,1	0,9195	3,2789	2,2184	2,4145
7a	0,436	1,0563	1,487	1,435	4,6459	50,7427	3,7968	2,797	1,4	1,1	0,2968	1,5436	1,1956	0,9764
W TOTAL LAPISAN I+II+III														17,9157
7b	0,304	1,0563	1,487	1,435	5,0156	56,7135	3,2930	2,293	1,4	0,893	0	0,8518	0,7123	0,4672
8a	0,333	1,0563	1,487	1,435	5,3339	62,7452	2,7477	1,748	1,4	0,348	0	0,6646	0,5910	0,3041
W TOTAL LAPISAN I+II														0,7713
8b	0,417	1,0563	1,487	1,435	5,7089	72,0784	1,8463	0,846	0,846	0	0	0,3728	0,3547	0,1145
W TOTAL LAPISAN I													11,3670	0,1145

Tabel 5.16 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 75^0 dengan jumlah pias 10

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	3,34	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	4,576
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,500
F1	1,483
F2	1,480
F3	1,479

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

1	0,5916	1,0563	1,487	1,435	0,2958	2,8258	5,9927	1,0966	0	0	1,0966	0,9310
2a	0,0784	1,0563	1,487	1,435	0,6308	6,0016	5,9667	2,3209	0	0	2,3209	0,2611
W TOTAL LAPISAN III												
2b	0,295	1,0563	1,487	1,435	0,8175	7,7588	5,9440	2,9950	0	0,550	2,4445	1,2763
W TOTAL LAPISAN II+III												
2c	0,2182	1,0563	1,487	1,435	1,0741	10,3125	5,9031	3,9117	0,407	1,1	2,4045	1,2036
3a	0,1568	1,0563	1,487	1,435	1,2616	12,1380	5,8659	4,5742	1,107	1,1	2,3673	0,9725
3b	0,4348	1,0563	1,487	1,435	1,5574	15,0444	5,7944	4,7944	1,4	1,1	2,2944	2,7857
4	0,5916	1,0563	1,478	1,435	2,0706	20,1879	5,6314	4,6314	1,4	1,1	2,1314	3,6461
5	0,5916	1,0563	1,478	1,435	2,6622	26,3402	5,3771	4,3771	1,4	1,1	1,8771	3,4302
6	0,5916	1,0563	1,478	1,435	3,2538	32,8403	5,0411	4,0411	1,4	1,1	1,5411	3,1450
7	0,5916	1,0563	1,478	1,435	3,8454	39,8590	4,6057	3,6057	1,4	1,1	1,1057	2,7754
8	0,5916	1,0563	1,478	1,435	4,4370	47,6888	4,0389	3,0389	1,4	1,1	0,5389	2,2942
9a	0,1402	1,0563	1,487	1,435	4,8029	53,1763	3,5961	2,5961	1,4	1,1	0,0961	0,4560
W TOTAL LAPISAN I+II+III												
9b	0,4515	1,0563	1,487	1,435	5,0988	58,1890	3,1627	2,1627	1,4	0,763	0	1,1798
10a	0,1746	1,0563	1,487	1,435	5,4118	64,4178	2,5908	1,5908	1,4	0,191	0	0,3077
W TOTAL LAPISAN I+II												
10b	0,4170	1,0563	1,487	1,435	5,7076	72,0390	1,8502	0,8502	0,850	0	0	0,3745
W TOTAL LAPISAN I												

Tabel 5.16 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 75^0 dengan jumlah pias 10 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,500	F1	1,483	F2	1,480	F0	1,500	F1	1,483	F2	1,480
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0124	0,0459	0,65223	0,665	1,02182		1,02208		1,02213		0,65046		0,65030		0,65026	
0,0016	0,0273	0,18293	0,185	1,04337		1,04391		1,04403		0,17690		0,17681		0,17679	

0,0082	0,1724	0,89414	0,902	1,05392	1,05462	1,05477	0,85617	0,85560	0,85547
0,0071	0,2156	0,84324	0,850	1,06748	1,06841	1,06861	0,79658	0,79589	0,79574
0,0051	0,2046	0,68129	0,686	1,07587	1,07697	1,07720	0,63798	0,63733	0,63719
0,0141	0,7234	1,95161	1,966	1,08698	1,08833	1,08862	1,80845	1,80620	1,80572
0,0192	1,2588	2,55439	2,574	1,09976	1,10156	1,10194	2,34016	2,33634	2,33552
0,0192	1,5226	2,40312	2,422	1,10340	1,10572	1,10621	2,19534	2,19075	2,18977
0,0192	1,7061	2,20331	2,223	1,09343	1,09626	1,09687	2,03263	2,02738	2,02626
0,0192	1,7794	1,94438	1,964	1,06688	1,07022	1,07094	1,84052	1,83477	1,83354
0,0192	1,6971	1,60727	1,627	1,01840	1,02225	1,02308	1,59712	1,59109	1,58981
0,0046	0,3651	0,31946	0,324	0,97303	0,97720	0,97810	0,33300	0,33157	0,33127
0,0173	1,0028	0,92223	0,940	0,96975	0,97469	0,97575	0,96881	0,96390	0,96285
0,0067	0,2776	0,24057	0,247	0,90155	0,90680	0,90793	0,27425	0,27266	0,27232
0,0175	0,3563	0,19922	0,217	0,64530	0,64907	0,64988	0,33586	0,33392	0,33350
	11,3549						16,84425	16,80451	16,79603

Tabel 5.17 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 75^0 dengan jumlah pias 10

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	3,34	5
E	0	0
F	7,499	3,6
G	6,873	2,5

L OC = R	6,000
L BC	5,916
L CD	4,576
L OB	1,000
L OA = R	6 000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	14,945
F	1,335

2b	0,2950	1,0563	1,487	1,435	0,8175	7,8309	5,9440	2,9950	0	0,550	2,4445	1,2763	0,1740	1,2644
W TOTAL LAPISAN II+III														1,2644
2c	0,0210	1,0563	1,487	1,435	0,9755	9,3569	5,9202	3,5608	0,0392	1,1	2,4216	0,1082	0,0176	0,1068
3a	0,3540	1,0563	1,487	1,435	1,1630	11,1766	5,8862	4,2266	0,7389	1,1	2,3876	2,0682	0,4011	2,0290
3b	0,139	1,0563	1,487	1,435	1,4095	13,5867	5,8321	4,8321	1,4	1,1	2,3321	0,8981	0,2111	0,8729
4	0,4930	1,0563	1,487	1,435	1,5865	15,3323	5,7865	4,7865	1,4	1,1	2,2865	3,1530	0,8340	3,0407
5	0,4930	1,0563	1,478	1,435	2,2185	21,7002	5,5748	4,5748	1,4	1,1	2,0748	2,9984	1,1091	2,7857
6	0,4930	1,0563	1,478	1,435	2,7115	26,8667	5,3524	4,3524	1,4	1,1	1,8524	2,8410	1,2844	2,5341
7	0,4930	1,0563	1,478	1,435	3,2045	32,2818	5,0726	4,0726	1,4	1,1	1,5726	2,6431	1,4122	2,2343
8	0,4930	1,0563	1,478	1,435	3,6975	38,0428	4,7253	3,7253	1,4	1,1	1,2253	2,3974	1,4779	1,8877
9	0,4930	1,0563	1,478	1,435	4,1905	44,3001	4,2941	3,2941	1,4	1,1	0,7941	2,0924	1,4618	1,4971
10a	0,4360	1,0563	1,487	1,435	4,6550	50,8806	3,7856	2,7856	1,4	1,1	0,2856	1,5366	1,1925	0,9691
W TOTAL LAPISAN I+II+III														17,9574
10b	0,0570	1,0563	1,487	1,435	4,9015	54,7773	3,4605	2,4605	1,4	1,361	0	0,1996	0,1631	0,1151
11	0,4930	1,0563	1,487	1,435	5,1765	59,6268	3,0338	2,0338	1,4	0,934	0	1,4136	1,2199	0,7143
12a	0,0760	1,0563	1,487	1,435	5,461	65,5264	2,48545	1,485	1,4	1,485	0	0,2803	0,2551	0,1160
W TOTAL LAPISAN I+II														0,9453
12b	0,4170	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,851	0	0	0,3746	0,3564	0,1154
W TOTAL LAPISAN I													11,6495	0,1154

Tabel 5.20 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 75^0 dengan jumlah pias 14

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	3,34	5
E	0	0

L OC = R	6,000
L BC	5,916
L CD	4,576
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	2,300

F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

Sudut COB	80,406
Sudut AOC	80,406

F1	1,573
F2	1,459
F3	1,437

pias ke	B	γ1	γ2	γ3	xi	α	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,4226	1,0563	1,487	1,435	0,2113	2,0182	5,9963	0,7849	0	0	0,7849	0,4760
2a	0,2474	1,0563	1,487	1,435	0,5463	5,2240	5,9751	2,0139	0	0	2,0139	0,7150
W TOTAL LAPISAN III												
2b	0 1752	1,0563	1,487	1,435	0,7576	7,2539	5,9520	2,7794	0	0,327	2,4525	0,7017
3a	0,1198	1,0563	1,487	1,435	0,9051	8,6762	5,9313	3,3092	0	0,877	2,4318	0,5744
W TOTAL LAPISAN II+III												
3b	0,3028	1,0563	1,487	1,435	1,1164	10,7233	5,8952	4,0617	0,565	1,1	2,3967	1,7174
4a	0,0722	1,0563	1,487	1,435	1,3039	12,5515	5,8566	4,7228	1,265	1,1	2,3580	0,4589
4b	0,3508	1,0563	1,478	1,435	1,0928	10 4940	5,8996	4,8996	1,4	1,1	2,3996	2,2971
5	0,4226	1,0563	1,478	1,435	1,5513	14,9840	5,7960	4,7960	1,4	1,1	2,2960	2,7044
6	0,4226	1,0563	1,478	1,435	2,3247	22,7959	5,5313	4,5313	1,4	1,1	2,0313	2,5439
7	0,4226	1,0563	1,478	1,435	2,7473	27,2506	5,3341	4,3341	1,4	1,1	1,8341	2,4243
8	0,4226	1,0563	1,478	1,435	3,1699	31,8918	5,0943	4,0943	1,4	1,1	1,5943	2,2788
9	0,4226	1,0563	1,478	1,435	3,5925	36,7804	4,8056	3,8056	1,4	1,1	1,3056	2,1038
10	0,4226	1,0563	1,478	1,435	4,0151	42,0041	4,4586	3,4586	1,4	1,1	0,9586	1,8933
11	0,4226	1,0563	1,478	1,435	4,4377	47 6988	4,0382	3,0382	1,4	1,1	0,5382	1,6384
12a	0,2200	1,0563	1,487	1,435	4,7590	52,4824	3,6540	2,6540	1,4	1,1	0,1540	0,7338
W TOTAL LAPISAN I+II+III												
12b	0,2030	1,0563	1,487	1,435	4,9705	55,9364	3,3607	2,3607	1,4	0,961	0	0,5902
13	0,4226	1,0563	1,487	1,435	5,2833	61,7088	2,8437	1,8437	1,4	0,444	0	0,9038

H	7,916	6
O	2	6

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,5916	1,0563	1,487	1,435	0,2958	2,8258	5,9927	1,0966	0	0	1,0966	0,9310	0,0459	0,9299
2a	0,0784	1,0563	1,487	1,435	0,6308	6,0348	5,9667	2,34688	0	0	2,3469	0,2640	0,0278	0,2626
W TOTAL LAPISAN III														1,1924
2b	0,295	1,0563	1,487	1,435	0,8175	7,7588	5,9440	2,9950	0	0,550	2,4445	1,2763	0,1724	1,2646
W TOTAL LAPISAN II+III														1,2646
2c	0,2182	1,0563	1,487	1,435	1,0741	10,3125	5,9031	3,9117	0,407	1,1	2,4045	1,2036	0,2156	1,1842
3a	0,1568	1,0563	1,487	1,435	1,2616	12,1380	5,8659	4,5742	0,293	1,1	3,1816	1,0208	0,2147	0,9980
3b	0,4348	1,0563	1,487	1,435	1,5574	15,0444	5,7944	4,794	1,4	1,1	2,2944	2,7857	0,7234	2,6902
4	0,5916	1,0563	1,478	1,435	2,0706	20,1879	5,6314	4,631	1,4	1,1	2,1314	3,6461	1,2588	3,4220
5	0,5916	1,0563	1,478	1,435	2,6622	26,3402	5,3771	4,377	1,4	1,1	1,8771	3,4302	1,5226	3,0738
6	0,5916	1,0563	1,478	1,435	3,2538	32,8403	5,0411	4,041	1,4	1,1	1,5411	3,1450	1,7061	2,6420
7	0,5916	1,0563	1,478	1,435	3,8454	39,8590	4,6057	3,606	1,4	1,1	1,1057	2,7754	1,7794	2,1300
8	0,5916	1,0563	1,478	1,435	4,4370	47,6888	4,0389	3,039	1,4	1,1	0,5389	2,2942	1,6971	1,5438
9a	0,1402	1,0563	1,487	1,435	4,8029	53,1763	3,5961	2,596	1,4	1,1	0,0961	0,4560	0,3651	0,2732
W TOTAL LAPISAN I+II+III														17,9570
9b	0,4515	1,0563	1,487	1,435	5,0988	58,1890	3,1627	2,163	1,4	0,763	0	1,1798	1,0028	0,6215
10a	0,1746	1,0563	1,487	1,435	5,4118	64,4178	2,5903	1,591	1,4	0,191	0	0,3077	0,2776	0,1328
W TOTAL LAPISAN I+II														0,7542
10b	0,4170	1,0563	1,487	1,435	5,7076	72,0390	1,8502	0,850	0,850	0	0	0,3745	0,3563	0,1153
W TOTAL LAPISAN I													11,3655	0,1153

Tabel 5.18 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 75^0 dengan jumlah pias 12

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	3,34	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	4,576
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,500
F1	1,482
F2	1,479
F3	1,478

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,4930	1,0563	1,487	1,435	0,2465	2,3546	5,9949	0,9149	0	0	0,9149	0,6472
2a	0,1770	1,0563	1,487	1,435	0,5815	5,5616	5,9718	2,1419	0	0	2,1419	0,5440
W TOTAL LAPISAN III												
2b	0,2950	1,0563	1,487	1,435	0,8175	7,8309	5,9440	2,9950	0	0,550	2,4445	1,2763
W TOTAL LAPISAN II+III												
2c	0,0210	1,0563	1,487	1,435	0,9755	9,3569	5,9202	3,5608	0,0392	1,1	2,4216	0,1082
3a	0,3540	1,0563	1,487	1,435	1,1630	11,1766	5,8862	4,2266	0,7389	1,1	2,3876	2,0682
3b	0,139	1,0563	1,487	1,435	1,4095	13,5867	5,8321	4,8321	1,4	1,1	2,3321	0,8981
4	0,4930	1,0563	1,487	1,435	1,5865	15,3323	5,7865	4,7865	1,4	1,1	2,2865	3,1530
5	0,4930	1,0563	1,478	1,435	2,2185	21,7002	5,5748	4,5748	1,4	1,1	2,0748	2,9984
6	0,4930	1,0563	1,478	1,435	2,7115	26,8667	5,3524	4,3524	1,4	1,1	1,8524	2,8410
7	0,4930	1,0563	1,478	1,435	3,2045	32,2818	5,0726	4,0726	1,4	1,1	1,5726	2,6431

8	0,4930	1,0563	1,478	1,435	3,6975	38,0428	4,7253	3,7253	1,4	1,1	1,2253	2,3974
9	0,4930	1,0563	1,478	1,435	4,1905	44,3001	4,2941	3,2941	1,4	1,1	0,7941	2,0924
10a	0,4360	1,0563	1,487	1,435	4,6550	50,8806	3,7856	2,7856	1,4	1,1	0,2856	1,5366
W TOTAL LAPISAN I+II+III												
10b	0,0570	1,0563	1,487	1,435	4,9015	54,7773	3,4605	2,4605	1,4	1,361	0	0,1996
11	0,4930	1,0563	1,487	1,435	5,1765	59,6268	3,0338	2,0338	1,4	0,934	0	1,4136
12a	0,0760	1,0563	1,487	1,435	5,4610	65,5284	2,4855	1,4855	1,4	0,385	0	0,1560
W TOTAL LAPISAN I+II												
12b	0,4170	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,851	0	0	0,3746
W TOTAL LAPISAN I												

Tabel 5.18 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 75^0 dengan jumlah pias 12 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,500	F1	1,482	F2	1,479	F0	1,500	F1	1,482	F2	1,479
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0104	0,0266	0,45344	0,464	1,01835		1,01858		1,01863		0,45543		0,45533		0,45531	
0,0037	0,0527	0,38114	0,385	1,04057		1,04111		1,04123		0,36985		0,36966		0,36962	
0,0082	0,1740	0,89414	0,902	1,05433		1,05508		1,05525		0,85583		0,85522		0,85509	
0,0007	0,0176	0,0758	0,076	1,06265		1,06355		1,06375		0,07197		0,07191		0,07190	
0,0115	0,4011	1,44896	1,460	1,07158		1,07266		1,07289		1,36290		1,36154		1,36124	
0,0045	0,2111	0,62918	0,634	1,08175		1,08306		1,08334		0,58580		0,58510		0,58495	
0,0160	0,8340	2,20892	2,225	1,08792		1,08939		1,08971		2,04513		2,04238		2,04178	
0,0160	1,1091	2,1006	2,117	1,10183		1,10388		1,10433		1,92100		1,91743		1,91666	
0,0160	1,2844	1,99036	2,006	1,10312		1,10563		1,10617		1,81882		1,81470		1,81381	
0,0160	1,4122	1,8517	1,868	1,09484		1,09781		1,09845		1,70592		1,70132		1,70032	
0,0160	1,4779	1,67957	1,696	1,07530		1,07872		1,07946		1,57685		1,57186		1,57078	

0,0160	1,4618	1,46588	1,482	1,04177	1,04565	1,04649	1,42248	1,41721	1,41607
0,0142	1,1925	1,07653	1,091	0,99312	0,99742	0,99836	1,09826	1,09352	1,09249
0,0022	0,1631	0,15604	0,158	1,00229	1,00734	1,00844	0,15786	0,15707	0,15689
0,0189	1,2199	1,10504	1,124	0,95500	0,96034	0,96149	1,17686	1,17031	1,16891
0,0029	0,1420	0,12191	0,125	0,88825	0,89388	0,89511	0,14052	0,13963	0,13944
0,0175	0,3564	0,19929	0,217	0,64535	0,64935	0,65022	0,33595	0,33388	0,33343
	11,5364						17,10146	17,05806	17,04869

Tabel 5.19 Perhitungan Stabilitas Lereng Metode Feilinius Untuk Sudut Kemiringan 75^0 dengan jumlah pias 12

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	3,34	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	4,576
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	15,091
F	1,315

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,4930	1,0563	1,487	1,435	0,2465	2,3546	5,9949	0,9149	0	0	0,9149	0,6472	0,0266	0,6467
2a	0,1770	1,0563	1,487	1,435	0,5815	5,5616	5,9718	2,1419	0	0	2,1419	0,5440	0,0527	0,5415
W TOTAL LAPISAN III														1,1882

14a	0,0052	1,0563	1,487	1,435	5,4972	66,3767	2,4043	1,4043	1,4	0,004	0	0,0077
W TOTAL LAPISAN I+II												
14b	0,417	1,0563	1,487	1,435	5,7085	72,0669	1,8474	0,8474	0,847	0	0	0,3736
W TOTAL LAPISAN I												

Tabel 5.20 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 75^0 dengan jumlah pias 14 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	2,300	F1	1,573	F2	1,459	F0	2,300	F1	1,573	F2	1,459
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0089	0,0168	0,3334	0,3423	1,01011		1,01507		1,01630		0,33890		0,33724		0,33683	
0,0052	0,0651	0,5009	0,5061	1,02359		1,03642		1,03958		0,49442		0,48830		0,48682	
0,0049	0,0886	0,4916	0,4965	1,03047		1,04826		1,05265		0,48181		0,47363		0,47166	
0,0033	0,0867	0,4024	0,4057	1,03451		1,05577		1,06102		0,39217		0,38428		0,38238	
0,0098	0,3197	1,2032	1,2130	1,03922		1,06544		1,07191		1,16723		1,13850		1,13163	
0,0023	0,0998	0,3215	0,3238	1,04230		1,07293		1,08048		0,31067		0,30181		0,29970	
0,0114	0,4185	1,6093	1,6207	1,03876		1,06443		1,07076		1,56020		1,52257		1,51357	
0,0137	1,1104	1,6984	1,7121	1,02845		1,09298		1,10889		1,66475		1,56646		1,54398	
0,0137	1,2044	1,5965	1,6102	1,00991		1,08437		1,10273		1,59443		1,48495		1,46022	
0,0137	1,2601	1,4739	1,4876	0,98322		1,06760		1,08841		1,51297		1,39339		1,36675	
0,0137	1,2674	1,3264	1,3402	0,94680		1,04110		1,06436		1,41546		1,28724		1,25912	
0,0137	1,2121	1,1478	1,1615	0,89813		1,00236		1,02806		1,29328		1,15880		1,12983	
0,0072	0,5822	0,5141	0,5212	0,85038		1,00309		0,96971		0,61296		0,51964		0,52666	
0,0078	0,4891	0,4614	0,4691	0,84142		0,97168		1,00380		0,55754		0,48280		0,46735	
0,0162	0,7960	0,7065	0,7227	0,77292		0,91137		0,94551		0,93498		0,79294		0,76431	
0,0002	0,0071	0,0060	0,0062	0,71175		0,85581		0,89133		0,00876		0,00729		0,00700	

0,0175	0,3555	0,1988	0,2163	0,52751		0,62930		0,65440		0,41002		0,34370	0,33051
	9,3795									14,75055		13,68353	13,47833

Tabel 5.21 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 75^0 dengan jumlah pias 14

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	3,34	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	4,576
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	15,144
F	1,382

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,4226	1,0563	1,487	1,435	0,2113	2,0182	5,9963	0,7849	0	0	0,7849	0,4760	0,0168	0,4757
2a	0,2474	1,0563	1,487	1,435	0,5463	5,2240	5,9751	2,0139	0	0	2,0139	0,7150	0,0651	0,7120
W TOTAL LAPISAN III														1,1877
2b	0,1752	1,0563	1,487	1,435	0,7576	7,2539	5,9520	2,7794	0	0,327	2,4525	0,7017	0,0886	0,6961
3a	0,1198	1,0563	1,487	1,435	0,7299	6,9873	5,9554	3,33332	0	0,224	3,1098	0,5744	0,0699	0,5702
W TOTAL LAPISAN II+III														1,2663
3b	0,3028	1,0563	1,487	1,435	1,1164	10,7233	5,8952	3,6146	0,565	1,1	1,9496	1,5231	0,2835	1,4965
4a	0,0722	1,0563	1,487	1,435	1,3039	12,5515	5,8566	4,2757	0,135	1,1	3,0410	0,4434	0,0964	0,4328
4b	0,3508	1,0563	1,487	1,435	1,5154	14,6294	5,8055	4,8055	1,4	1,1	2,3055	2,2531	0,5693	2,1800

5	0,4226	1,0563	1,478	1,435	1,4795	14,2754	5,8147	4,8147	1,4	1,1	2,3147	2,7157	0,6699	2,6318
6	0,4226	1,0563	1,478	1,435	1,9021	18,4826	5,6905	4,6905	1,4	1,1	2,1905	2,6404	0,8374	2,5041
7	0,4226	1,0563	1,478	1,435	2,7473	27,2506	5,3341	4,8147	1,4	1,1	2,3147	2,7157	1,2440	2,4141
8	0,4226	1,0563	1,478	1,435	3,1699	31,8918	5,0943	4,0943	1,4	1,1	1,5943	2,2788	1,2044	1,9346
9	0,4226	1,0563	1,478	1,435	3,5925	36,7804	4,8056	3,8056	1,4	1,1	1,3056	2,1038	1,2601	1,6847
10	0,4226	1,0563	1,478	1,435	4,0151	42,0041	4,4586	3,4586	1,4	1,1	0,9586	1,8933	1,2674	1,4066
11	0,4226	1,0563	1,478	1,435	4,4377	47,6988	4,0382	3,0382	1,4	1,1	0,5382	1,6384	1,2121	1,1023
12a	0,2200	1,0563	1,487	1,435	4,7590	52,4824	3,6540	2,6540	1,4	1,1	0,1540	0,7338	0,5822	0,4467
W TOTAL LAPISAN I+II+III														18,2341
12b	0,2030	1,0563	1,487	1,435	4,9705	55,9364	3,3607	2,3607	1,4	0,961	0	0,5902	0,4891	0,3304
13	0,4226	1,0563	1,487	1,435	5,2833	61,7088	2,8437	1,8437	1,4	0,444	0	0,9038	0,7960	0,4280
14a	0,0052	1,0563	1,487	1,435	5,4972	66,3767	2,4043	1,4043	1,4	0,004	0	0,0077	0,0071	0,0031
W TOTAL LAPISAN I+II														0,7615
14b	0,417	1,0563	1,487	1,435	5,7033	71,9063	1,8634	0,8634	0,863	0	0	0,3807	0,3619	0,1180
W TOTAL LAPISAN I													11,1212	0,1180

Jadi koordinat D (4,887;5).

$L\overline{CD}$ = XC – XD = 7,916 – 4,887 = 3,029 m.

Koordinat E didapat: (0,0).

$L\overline{OB}$ = YO – YB = 6 – 5 = 1 m.

$L\overline{OC}$ = R $= \sqrt{(XA-XO)^2+(YA-YO)^2}$ $= \sqrt{(2-2)^2+(2-6)^2} = 6$ m.

$L\overline{OA}$ = R = 6 m

$L\overline{OE}$ = YO – YE = 6 - 0 = 6 m

$L\overline{EA}$ = XA – XE = 2 – 0 = 2 m.

Koordinat F:

XF $= \sqrt{\left(L\overline{OA}\right)^2+\left(L\overline{OE}-YF\right)^2}+2$ $= \sqrt{(6)^2+(6-3{,}6)^2}+2$ = 7,499 m.

YF = $H_2 + H_3$ =2,5 + 1,1 = 3,6 m.

Jadi koordinat F: (7,499;3,6).

Koordinat G:

XG $= \sqrt{\left(L\overline{OA}\right)^2+\left(L\overline{OE}-YG\right)^2}+2$ $= \sqrt{(6)^2+(6-2{,}5)^2}+2$ = 6,873 m.

YG = H_3 =2,5 m.

Jadi koordinat F: (6,873;2,5).

Koordinat H: (XC,YO) = (7,916;6).

$\angle$COB = arc tan $\frac{L\overline{BC}}{L\overline{OB}}$ = arc tan $\frac{6}{1}$ = $80{,}406^0$.

$\angle$AOC = $90^0 - \angle$AOE = $90^0 - 19{,}471^0 = 80{,}406^0$.

$\angle$COF = 2 x arc sin $\left(\frac{\left(\sqrt{(XC-XF)^2+(YC-YF)^2}/2\right)}{R}\right)$ = $13{,}984^0$.

$\angle FOG$ $= 2 \text{ x arc sin} \left(\frac{\left(\sqrt{(XF - XG)^2 + (YF - YG)^2} / 2 \right)}{R} \right)$ $= 12{,}107^0.$

$\angle GOA$ $= \text{arc sin} \left(\frac{\left(\sqrt{(XG - XA)^2 + (YG - YA)^2} / 2 \right)}{R} \right)$ $= 54{,}315^0.$

$L\overline{CF} = \frac{\angle COF}{360} \text{ x } 2\pi \text{ x R} = 1{,}464 \text{ m.}$

$L\overline{FG} = \frac{\angle COF}{360} \text{ x } 2\pi \text{ x R} = 1{,}268 \text{ m.}$

$L\overline{GA} = \frac{\angle COF}{360} \text{ x } 2\pi \text{ x R} = 5{,}688 \text{ m.}$

$\varphi_1 = 28; \quad \varphi_2 = 38; \quad \varphi_3 = 35.$

$c_1 = 0{,}042; \quad C_2 = 0{,}035; \quad C_3 = 0{,}021.$

Lebar tiap pias $= \frac{L\overline{CD}}{6} = 0{,}986 \text{ m.}$

Hitungan untuk pias 1 dengan metode Bishop:

$x_1 = \frac{1}{2} \text{ x } B_1 = \frac{1}{2} \text{ x } 0{,}986 = 0{,}4930 \text{ m.}$

$\theta_1 = \text{arc sin} \frac{x_1}{R} = 4{,}7131^0.$

$y_1 = \frac{x_1}{\tan \theta_1} = 5{,}9797 \text{ m.}$

$h_1 = (x_1 \tan \alpha) - (L\overline{OE} - y_1) = 0{,}8336 \text{ m.}$

$W = (B_{1a} \text{ x } h_1 \text{ x } \gamma_1) + (B_{1a} \text{ x } h_2 \text{ x } \gamma_2) + (B_{1a} \text{ x } h_3 \text{ x } \gamma_3)$

$= (0{,}670 \text{ x } 0 \text{ x } 1{,}0563) + (0{,}670 \text{ x } 1{,}487) + (0{,}670 \text{ x } 0{,}8336 \text{ x } 1{,}435)$

$= 1.1795 \text{ t/m.}$

$C_r \text{ x } B_1 = C_3 \text{ x } B_{1a} = 0{,}0207 \text{ t/m.}$

Tabel 5.22 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 60^0 dengan jumlah pias 6

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	4,89	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	3,029
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,300
F1	1,298
F2	1,298
F3	1,297

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,986	1,0563	1,487	1,435	0,4930	4,7131	5,9797	0,8336	0	0	0,8336	1,1795
2a	0,457	1,0563	1,487	1,435	1,2147	11,6803	5,8757	1,9796	0	0	1,9796	1,2993
W TOTAL LAPISAN III												
2b	0,529	1,0563	1,487	1,435	1,7077	16,5359	5,7517	2,7095	0	0,46	2,2517	2,0678
3a	0,1065	1,0563	1,487	1,435	2,0253	19,7272	5,5220	3,0299	0	1,01	2,0221	0,4686
W TOTAL LAPISAN II+III												
3b	0,809	1,0563	1,487	1,435	2,4828	24,4432	5,4618	3,7621	0,70018	1,1	1,9619	4,1966
3c	0,071	1,0563	1,487	1,435	2,9225	29,1491	5,2395	4,2395	1,4	1,1	1,7395	0,3984
4	0,986	1,0563	1,478	1,435	3,4510	35,1113	4,9074	3,9074	1,4	1,1	1,4074	5,0525
5a	0,057	1,0563	1,487	1,435	3,9725	41,4590	4,4954	3,4954	1,4	1,1	0,9954	0,2589
W TOTAL LAPISAN I+II+III												
5b	0,929	1,0563	1,487	1,435	4,4655	48,0947	4,0074	3,0059	1,4	1,606	0	3,5922

Tabel 5.23 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 60^0 dengan jumlah pias 6

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	4,89	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

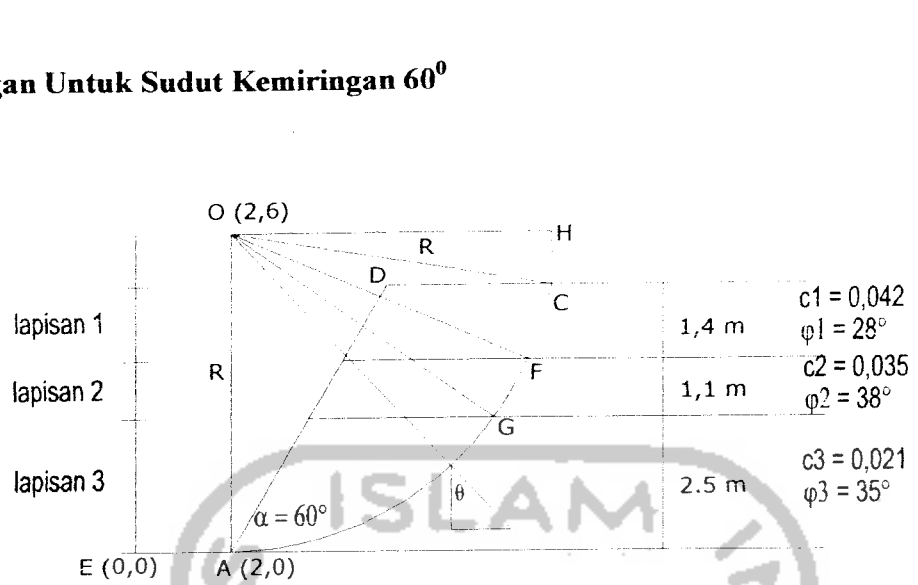
L OC = R	6,000
L BC	5,916
L CD	3,029
L OB	1 000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	11,898
F	1,171

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos α
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,986	1,0563	1,487	1,435	0,4930	4,7131	5,9797	0,8336	0	0	0,8336	1,1795	0,0970	1,1755
2a	0,457	1,0563	1,487	1,435	1,2147	11,6803	5,8757	1,9796	0	0	1,9796	1,2993	0,2632	1,2724
W TOTAL LAPISAN I														2,4479
2b	0,529	1,0563	1,487	1,435	1,7077	16,5359	5,7517	2,7095	0	0,46	2,2517	2,0678	0,5888	1,9823
3a	0,1065	1,0563	1,487	1,435	2,0253	19,7272	5,6476	3,15542	0	1,01	2,1476	0,4878	0,1647	0,4592
W TOTAL LAPISAN II+III														2,4415
3b	0,809	1,0563	1,487	1,435	2,4828	24,4432	5,4618	3,8674	0,70018	1,1	2,0673	4,3189	1,7878	3,9318
3c	0,071	1,0563	1,487	1,435	2,9225	29,1491	5,2395	4,2395	1,4	1,1	1,7395	0,3984	0,1941	0,3479
4	0,986	1,0563	1,478	1,435	3,4510	35,1113	4,9074	3,9074	1,4	1,1	1,4074	5,0525	2,9070	4,1331
5a	0,057	1,0563	1,487	1,435	3,9725	41,4590	4,4954	3,4954	1,4	1,1	0,9954	0,2589	0,1715	0,1941
W TOTAL LAPISAN I+II+III														8,6068
5b	0,929	1,0563	1,487	1,435	4,4655	48,0947	4,0074	3,0074	1,4	1,607	0	3,5943	2,6759	2,4007
6a	0,569	1,0563	1,487	1,435	5,2145	60,3523	2,9680	1,9680	1,4	0,568	0	1,3220	1,1492	0,6540

5.4 Perhitungan Untuk Sudut Kemiringan 60^0



Gambar 5.4 Koordinat dan bidang longsor pada sudut 60^0

Hitungan stabilitas lereng dengan sudut 60^0 dan jumlah pias 6.

Menentukan koordinat awal, titik A = (2,0) dan O = (2,6).

Koordinat E = (0,0); koordinat B = (2,5).

Panjang OB = $L\overline{OB}$ = 1 m, $L\overline{OA}$ = R = 6 m.

$L\overline{BC} = \sqrt{L\overline{OA}^2 - L\overline{OB}^2} = \sqrt{6^2 - 1^2}$ = 5,916 m.

Koordinat C (XC,YC):

XC = $L\overline{BC}$ + 2 = 5,916 + 2 = 7,916 m ; YC = 5,0 m.

Jadi koordinat C (7,916;5).

Koordinat D (XD,YD)

YD = 5

$$XD = \frac{YD}{\tan\alpha} + 2 = \frac{5}{\tan 60} + 2 = 2{,}887 + 2 = 4{,}887.$$

$W \sin \theta_1$ $= 1{,}1795 \sin (4{,}7131^0) = 0{,}0970$ t/m.

$W \tan \varphi_3$ $= 1{,}1795 \tan 35^0 = 0{,}8263$ t/m.

$(c_1 \times B_{1a}) + W \tan \varphi_3 = 0{,}847$ t/m.

Untuk mencari F dilakukan dengan iterasi yang berulang *(trial and error)*.

Dicari M dengan F coba-coba,

F_0 $= 1{,}300$ didapat M_1 pada lapis 1 $= 1{,}04091$

$((c_1 \times B_1) + W \tan \varphi_3)/ M_{1a} = 0{,}81372$ (pada lapis 1).

F_1 $= (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_1)/(\Sigma W \sin \theta_1) = 1{,}298$.

Dari F_1 didapat $M_2 = 1{,}04098$ (pada lapis 1)

$((c_1 \times B_1) + W \tan \varphi_3)/ M_2 = 0{,}81366$.

F_2 $= (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_2)/ (\Sigma W \sin \theta_1) = 1{,}298$.

Dari F_2 didapat $M_3 = 1{,}04100$.

$((c_1 \times B_1) + W \tan \varphi_3)/ M_3 = 0{,}81365$.

F_3 $= (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_3)/ (\Sigma W \sin \theta_1) = 1{,}297$.

Karena nilai F_3 mendekati F_2, iterasi dihentikan dan didapat nilai F =1,297.

Hitungan untuk pias ke 1 dengan metode Fellinius:

x_1 $= \frac{1}{2} \times B_1 = \frac{1}{2} \times 0{,}986 = 0{,}4930$ m.

θ_1 $= \text{arc sin } \frac{x_1}{R} = 4{,}7131^0$.

y_1 $= \frac{x_1}{\tan \theta_1} = 5{,}9797$ m.

h_1 $= (x_1 \tan \alpha) - (L\overline{OE} - y_1) = 0{,}8336$ m.

$W = (B_{1a} \times h_1 \times \gamma_1) + (B_{1a} \times h_2 \times \gamma_2) + (B_{1a} \times h_3 \times \gamma_3)$

$= (0{,}670 \times 0 \times 1{,}0563) + (0{,}670 \times 0 \times 1{,}487) + (0{,}670 \times 0{,}8336 \times 1{,}435)$

= 1,1795 t/m

$W \sin \theta_1$ = 1,1795 sin ($4,7131^0$) = 0,0970 t/m.

$W \cos \theta_1$ = 1,1795 cos ($4,7131^0$) = 1,1755 t/m.

$\Sigma W \sin \theta$ = 10,3544 t/m.

$\Sigma W \cos \theta$ untuk lap. III = 2,4479 t/m.

$\Sigma W \cos \theta$ untuk lap. II + III = 2,4415 t/m.

$\Sigma W \cos \theta$ untuk lap. I + II + III = 8,6068 t/m.

$\Sigma W \cos \theta$ untuk lap. I + II = 3,0546 t/m.

$\Sigma W \cos \theta$ untuk lap. I = 0,1152 t/m

$L\overline{AC} \times c = (L\overline{CF} \times c_1) + (L\overline{FG} \times c_2) + (L\overline{GA} \times c_3)$ = 0,225 m.

$W \cos \theta \times \tan \varphi$ = (2,4479 x 35,000) + (2,4415 x 35,000) + (8,6068 x 35,000) +

(3,0546 x 38,000) + (0,1152 x 28,000)

= 11,898 t/m.

$F = ((L\overline{AC} \times c) + (W \cos \theta \times \tan \varphi))/(\Sigma W \sin \theta)$

= (0,225 + 11,898)/10,3544

= 1,171.

6a	0,569	1,0563	1,487	1,435	5,2145	60,3523	2,9680	1,9658	1,4	0,566	0	1,3202
W TOTAL LAPISAN I+II												
6b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8476	0,8476	0,848	0	0	0,3734
W TOTAL LAPISAN I												

Tabel 5.22 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 60^0 dengan jumlah pias 6 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,300	F1	1,298	F2	1,298	F0	1,300	F1	1,298	F2	1,298
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0207	0,0970	0,8263	0,847	1,04091		1,04098		1,04100		0,81372		0,81366		0,81365	
0,0096	0,2632	0,91028	0,920	1,08842		1,08858		1,08863		0,84516		0,84503		0,84500	
0,0147	0,5888	1,44867	1,463	1,11205		1,11228		1,11234		1,31589		1,31562		1,31555	
0,0030	0,1582	0,32831	0,331	1,12324		1,12351		1,12358		0,29492		0,29485		0,29483	
0,0263	1,7372	2,94002	2,966	1,13338		1,13371		1,13380		2,61722		2,61645		2,61625	
0,0023	0,1941	0,27908	0,281	1,13584		1,13623		1,13634		0,24774		0,24765		0,24763	
0,0320	2,9070	3,53962	3,572	1,12796		1,12842		1,12854		3,16647		3,16518		3,16484	
0,0019	0,1715	0,18141	0,183	1,10615		1,10668		1,10682		0,16568		0,16560		0,16558	
0,0355	2,6743	2,80812	2,844	1,11532		1,11598		1,11616		2,54963		2,54812		2,54771	
0,0218	1,1476	1,03199	1,054	1,01702		1,01779		1,01800		1,03612		1,03533		1,03512	
0,0175	0,3552	0,19862	0,216	0,69726		0,69783		0,69799		0,30997		0,30972		0,30965	
	10,2941									13,36251		13,35722		13,35580	

W TOTAL LAPISAN I+II														3,0546
6b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8476	0,8476	0,848	0	0	0,3734	0,3552	0,1152
W TOTAL LAPISAN I													10,3544	0,1152

Tabel 5.24 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 60^0 dengan jumlah pias 8

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	4,89	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	3,029
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,380
F1	1,318
F2	1,295
F3	1,289

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,7395	1,0563	1,487	1,435	0,3698	3,5331	5,9886	0,6290	0	0	0,6290	0,6675
2a	0,7039	1,0563	1,487	1,435	1,0915	10,4809	5,8998	1,7903	0	0,000	1,7903	1,8083
W TOTAL LAPISAN III												
2b	0,0356	1,0563	1,487	1,435	1,4612	14,0952	5,8192	2,3501	0	0,031	2,3193	0,1201
3a	0,5995	1,0563	1,487	1,435	1,7788	17,2450	5,7301	2,8109	0	0,581	2,2301	2,4363
W TOTAL LAPISAN II+III												
3b	0,1400	1,0563	1,487	1,435	2,1485	20,9825	5,6018	3,3231	0,1212	1,1	2,1019	0,6692
4a	0,6685	1,0563	1,487	1,435	2,5528	25,1797	5,4294	4,4294	1,4	1,1	1,9294	3,9329

4b	0,0711	1,0563	1,478	1,435	2,9226	29,1496	5,2395	4,2395	1,4	1,1	1,7395	0,3982
5	0,7395	1,0563	1,478	1,435	3,3279	33,6860	4,9917	3,9917	1,4	1,1	1,4917	3,8789
6	0,7395	1,0563	1,478	1,435	4,0674	42,6791	4,4098	3,4098	1,4	1,1	0,9098	3,2613
7a	0,3035	1,0563	1,478	1,435	4,5889	49,8899	3,8639	2,8639	1,4	1,1	0,3639	1,1008
W TOTAL LAPISAN I+II+III												
7b	0,436	1,0563	1,487	1,435	4,9586	55,7341	3,3763	2,3763	1,4	0,976	0	1,2777
8a	0,323	1,0563	1,487	1,435	5,3379	62,8283	2,7376	1,7376	1,4	0,338	0	0,6388
W TOTAL LAPISAN I+II												
8b	0,417	1,0563	1,487	1,435	5,7076	72,0390	1,8473	0,8473	0,847	0,000	0	0,3732
W TOTAL LAPISAN I												

Tabel 5.24 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 60^0 dengan jumlah pias 8 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,380	F1	1,318	F2	1,295	F0	1,380	F1	1,318	F2	1,295
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0155	0,0412	0,46763	0,483	1,02940		1,03087		1,03145		0,46936		0,46869		0,46843	
0,0148	0,3291	1,26687	1,282	1,07569		1,08005		1,08176		1,19148		1,18667		1,18479	
0,0010	0,0293	0,08415	0,085	1,09355		1,09939		1,10168		0,07785		0,07744		0,07728	
0,0166	0,7225	1,70682	1,723	1,10557		1,11267		1,11547		1,55888		1,54893		1,54505	
0,0046	0,2397	0,46882	0,473	1,11549		1,12407		1,12745		0,42436		0,42112		0,41986	
0,0217	1,6739	2,75532	2,777	1,12097		1,13117		1,13518		2,47735		2,45502		2,44635	
0,0023	0,1940	0,27898	0,281	1,12062		1,13229		1,13688		0,25101		0,24843		0,24742	
0,0240	2,1522	2,71745	2,741	1,11363		1,12692		1,13215		2,46175		2,43272		2,42149	
0,0240	2,2115	2,28477	2,309	1,07921		1,09545		1,10184		2,13934		2,10762		2,09540	
0,0099	0,8421	0,77116	0,781	1,03237		1,05069		1,05790		0,75654		0,74334		0,73828	

0,0167	1,0562	0,99881	1,015	0,98237	1,05307	1,06176	1,03370	0,96430	0,95641
0,0123	0,5684	0,49937	0,512	0,90601	0,98411	0,99346	0,56355	0,51997	0,51508
0,0175	0,3551	0,19854	0,216	0,67464	0,69195	0,69875	0,32025	0,31225	0,30920
	10,4153						13,72545	13,48650	13,42504

Tabel 5.25 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 60^0 dengan jumlah pias 8

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	4,89	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	3,029
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	11,852
F	1,248

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,7395	1,0563	1,487	1,435	0,3698	3,5331	5,9886	0,6290	0	0	0,6290	0,6675	0,0412	0,6662
2a	0,7039	1,0563	1,487	1,435	1,0915	10,4809	5,8998	1,7903	0	0,610	1,1807	1,8306	0,3331	1,8001
W TOTAL LAPISAN III														2,4663
2b	0,0356	1,0563	1,487	1,435	1,4612	14,0952	5,8192	2,3501	0	0,031	2,3193	0,1201	0,0293	0,1165
3a	0,5995	1,0563	1,487	1,435	1,7788	17,2450	5,7301	2,8109	0	0,581	2,2301	2,4363	0,7225	2,3267
W TOTAL LAPISAN II+III														2,4432
3b	0,1400	1,0563	1,487	1,435	2,1485	20,9825	5,6018	3,3231	0,12124	1,1	2,1019	0,6692	0,2397	0,6248

4a	0,6685	1,0563	1,487	1,435	2,5528	25,1797	5,4294	3,8509	0,82143	1,1	1,9295	3,5245	1,5001	3,1893
4b	0,0711	1,0563	1,478	1,435	2,9226	29,1496	5,2395	4,2395	1,4	1,1	1,7395	0,3982	0,1940	0,3477
5	0,7395	1,0563	1,478	1,435	3,3279	33,6860	4,9917	3,9917	1,4	1,1	1,4917	3,8789	2,1522	3,2271
6	0,7395	1,0563	1,478	1,435	4,0674	42,6791	4,4098	3,4098	1,4	1,1	0,9098	3,2613	2,2115	2,3969
7a	0,3035	1,0563	1,478	1,435	4,5889	49,8899	3,8639	2,8639	1,4	1,1	0,3639	1,1008	0,8421	0,7089
W TOTAL LAPISAN I+II+III														10,4947
7b	0,436	1,0563	1,487	1,435	4,9586	55,7341	3,3763	2,3763	1,4	0,976	0	1,2777	1,0562	0,7190
8a	0,323	1,0563	1,487	1,435	4,9019	54,7831	3,4582	2,4582	1,4	1,058	0	0,9844	0,8044	0,5673
W TOTAL LAPISAN I+II														1,2863
8b	0,417	1,0563	1,487	1,435	5,7076	72,0390	1,8473	0,8473	0,847	0	0	0,3732	0,3551	0,1149
W TOTAL LAPISAN I													9,6770	0,1149

Tabel 5.26 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 60^0 dengan jumlah pias 10

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	4,89	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	3,029
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,500
F1	1,335
F2	1,297
F3	1,287

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12

1	0,5916	1,0563	1,487	1,435	0,2958	2,8258	5,9927	0,5050	0	0	0,5050	0,4288
2	0,5916	1,0563	1,487	1,435	0,8874	8,5052	5,9340	1,4710	0	0	1,4710	1,2488
3a	0,2602	1,0563	1,487	1,435	1,3133	12,6435	5,8545	2,1292	0	0	2,1292	0,7950
W TOTAL LAPISAN III												
3b	0,3314	1,0563	1,487	1,435	1,6091	15,0125	5,7802	2,5673	0	0,287	2,2802	1,2258
4a	0,3037	1,0563	1,487	1,435	1,9267	17,8023	5,68225	3,0193	0	0,837	2,1823	1,3291
W TOTAL LAPISAN II+III												
4b	0,2879	1,0563	1,487	1,435	2,2225	21,7408	5,5732	3,4226	0,249	1,1	2,0733	1,4033
5a	0,5206	1,0563	1,487	1,435	2,6267	25,9625	5,3945	3,9441	0,950	1,1	1,8946	2,7890
5b	0,0710	1,0563	1,487	1,435	2,9225	29,1491	5,2401	4,240	1,4	1,1	1,7401	0,3984
6	0,5916	1,0563	1,478	1,435	3,2538	32,8403	5,0411	4,041	1,4	1,1	1,5411	3,1450
7	0,5916	1,0563	1,478	1,435	3,8454	39,8590	4,6057	3,606	1,4	1,1	1,1057	2,7754
8	0,5916	1,0563	1,478	1,435	4,4370	47,6888	4,0389	3,039	1,4	1,1	0,5389	2,2942
9a	0,1402	1,0563	1,478	1,435	4,8029	53,1763	3,5961	2,596	1,4	1,1	0,0961	0,4546
W TOTAL LAPISAN I+II+III												
9b	0,4514	1,0563	1,487	1,435	5,0987	58,1881	3,1607	2,161	1,4	0,761	0	1,1782
10a	0,175	1,0563	1,487	1,435	5,4117	64,4156	2,5910	1,591	1,4	0,191	0	0,3078
W TOTAL LAPISAN I+II												
10b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,851	0,851	0	0	0,3746
W TOTAL LAPISAN I												

Tabel 5.26 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 60^0 dengan jumlah pias 10 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)			**16/17** (t/m)		
(t/m)	(t/m)	(t/m)	(t/m)	F0 1,500	F1 1,335	F2 1,297	F0 1,500	F1 1,335	F2 1,297
13	14	15	16	17a	17b	17c	18a	18b	18c
0,0124	0,0211	0,30038	0,313	1,02182	1,02467	1,02542	0,30612	0,30527	0,30504
0,0124	0,1848	0,8749	0,887	1,05810	1,06664	1,06892	0,83860	0,83188	0,83011
0,0055	0,1741	0,55697	0,562	1,07800	1,09065	1,09401	0,52174	0,51569	0,51410

0,0092	0,3177	0,85878	0,868	1,08687	1,10184	1,10582	0,79860	0,78776	0,78492
0,0084	0,4065	0,93111	0,940	1,09493	1,11259	1,11729	0,85808	0,84446	0,84090
0,0094	0,5200	0,98311	0,992	1,10188	1,12328	1,12897	0,90070	0,88354	0,87909
0,0169	1,2215	1,95393	1,971	1,10354	1,12884	1,13557	1,78592	1,74591	1,73556
0,0023	0,1941	0,27913	0,281	1,10083	1,12897	1,13646	0,25566	0,24928	0,24764
0,0192	1,7061	2,20331	2,223	1,09343	1,12476	1,13310	2,03263	1,97601	1,96147
0,0192	1,7794	1,94438	1,964	1,06688	1,10390	1,11375	1,84052	1,77878	1,76305
0,0192	1,6971	1,60727	1,627	1,01840	1,06112	1,07248	1,59712	1,53281	1,51657
0,0046	0,3640	0,31849	0,323	0,97303	1,01927	1,03157	0,33200	0,31694	0,31316
0,0173	1,0014	0,92098	0,938	0,96976	1,02453	1,03911	0,96751	0,91578	0 90294
0,0067	0,2777	0,24061	0,247	0,90158	0,95972	0,97518	0,27429	0,25767	0,25359
0,0175	0,3564	0,19929	0,217	0,64535	0,68707	0,69817	0,33595	0,31555	0,31054
	10,2219						13,64544	13,25733	13,15868

Tabel 5.27 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 60^0 dengan jumlah pias 10

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	4,89	5
E	0	0
F	7,499	3,6
G	6,873	2,5

L OC = R	6,000
L BC	5,916
L CD	3,029
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	11,368
F	1,148

0,0022	0,1423	0,13616	0,138	1,06780	1,07279	1,07411	0,12956	0,12895	0,12880
0,0189	1,0301	0,93312	0,952	1,02419	1,02945	1,03084	0,92950	0,92474	0,92349
0,0029	0,1111	0,09541	0,098	0,96124	0,96680	0,96826	0,10228	0,10169	0,10154
0,0175	0,3564	0,19929	0,217	0,69726	0,70121	0,70225	0,31094	0,30919	0,30873
	10,2545						13,19690	13,16204	13,15289

Tabel 5.29 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 60^0 dengan jumlah pias 12

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	4,89	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	3,029
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	13,489
F	1,279

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,4930	1,0563	1,487	1,435	0,2465	2,3546	5,9949	0,4219	0	0	0,4219	0,2985	0,0123	0,2982
2	0,4930	1,0563	1,487	1,435	0,7395	7,0797	5,9543	1,2351	0	0	1,2351	0,8738	0,1077	0,8671
3a	0,4574	1,0563	1,487	1,435	1,2147	11,6803	5,8758	1,97968	0	0	1,9797	1,2994	0,2632	1,2725
W TOTAL LAPISAN III														2,4378
3b	0,0356	1,0563	1,487	1,435	1,4612	14,0952	5,8194	2,3502	0	0,031	2,3194	0,1201	0,0293	0,1165

H	7,916	6
O	2	6

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,5916	1,0563	1,487	1,435	0,2958	2,8258	5,9927	0,5050	0	0	0,5050	0,4288	0,0211	0,4282
2	0,5916	1,0563	1,487	1,435	0,8874	8,5052	5,9340	1,4710	0	0	1,4710	1,2488	0,1848	1,2351
3a	0,2602	1,0563	1,487	1,435	0,7217	6,9085	5,9564	1,2065	0	0	1,2065	0,4505	0,0542	0,4472
W TOTAL LAPISAN III														2,1105
3b	0,3314	1,0563	1,487	1,435	1,6091	15,0125	5,7802	2,5673	0	0,287	2,2802	1,2258	0,3177	1,1840
4a	0,3037	1,0563	1,487	1,435	1,9267	17,8023	5,68225	3,0193	0	0,837	2,1823	1,3291	0,4065	1,2654
W TOTAL LAPISAN II+III														2,4493
4b	0,2879	1,0563	1,487	1,435	2,2225	21,7408	5,5732	3,4226	0,249	1,1	2,0733	1,4033	0,5200	1,3034
5a	0,5206	1,0563	1,487	1,435	2,6267	25,9625	5,3945	3,9441	0,950	1,1	1,8946	2,7890	1,2215	2,5073
5b	0,0710	1,0563	1,487	1,435	2,9225	29,1491	5,2401	4,240	1,4	1,1	1,7401	0,3984	0,1941	0,3479
6	0,5916	1,0563	1,478	1,435	3,2538	32,8403	5,0411	4,041	1,4	1,1	1,5411	3,1450	1,7061	2,6420
7	0,5916	1,0563	1,478	1,435	3,8454	39,8590	4,6057	3,606	1,4	1,1	1,1057	2,7754	1,7794	2,1300
8	0,5916	1,0563	1,478	1,435	4,4370	47,6388	4,0389	3,039	1,4	1,1	0,5389	2,2942	1,6971	1,5438
9a	0,1402	1,0563	1,478	1,435	4,8029	53,1763	3,5961	2,596	1,4	1,1	0,0961	0,4546	0,3640	0,2723
W TOTAL LAPISAN I+II+III														10,7468
9b	0,4514	1,0563	1,487	1,435	5,0987	58,1881	3,1607	2,161	1,4	0,761	0	1,1782	1,0014	0,6206
10a	0,175	1,0563	1,487	1,435	5,4117	64,4156	2,5910	1,591	1,4	0,191	0	0,3078	0,2777	0,1328
W TOTAL LAPISAN I+II														0,7534
10b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,851	0,851	0	0	0,3746	0,3564	0,1154
W TOTAL LAPISAN I													10,1020	0,1154

Tabel 5.28 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 60^0 dengan jumlah pias 12

titik	koordinat	L OC = R	6,000	φ1	28,000

	X	Y
A	2	0
B	2	5
C	7,916	5
D	4,89	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L BC	5,916
L CD	3,029
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,300
F1	1,287
F2	1,284
F3	1,283

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,4930	1,0563	1,487	1,435	0,2465	2,3546	5,9949	0,4219	0	0	0,4219	0,2985
2	0,4930	1,0563	1,487	1,435	0,7395	7,0797	5,9543	1,2351	0	0	1,2351	0,8738
3a	0,4574	1,0563	1,487	1,435	1,2147	11,6803	5,8758	1,9797	0	0	1,9797	1,2994
W TOTAL LAPISAN III												
3b	0,0356	1,0563	1,487	1,435	1,4612	14,0952	5,8194	2,3502	0	0,031	2,3194	0,1201
4	0,4930	1,0563	1,487	1,435	1,7255	16,7133	5,7465	2,7352	0	0,489	2,2466	1,9475
5a	0,1155	1,0563	1,487	1,435	1,5368	14,8403	5,7999	2,4616	0	1,016	1,4460	0,4141
W TOTAL LAPISAN II+III												
5b	0,3775	1,0563	1,487	1,435	2,2763	22,2950	5,5515	3,4940	0,3269	1,1	2,0671	1,8676
6a	0,4220	1,0563	1,487	1,435	2,6760	26,4873	5,3702	4,3702	1,4	1,1	1,8702	2,4469
6b	0,0710	1,0563	1,487	1,435	2,9225	29,1491	5,2401	4,2401	1,4	1,1	1,7401	0,3984
7	0,4930	1,0563	1,478	1,435	3,2045	32,2818	5,0726	4,0726	1,4	1,1	1,5726	2,6431
8	0,4930	1,0563	1,478	1,435	3,6975	38,0428	4,7253	3,7253	1,4	1,1	1,2253	2,3974
9	0,4930	1,0563	1,478	1,435	4,1905	44,3001	4,2941	3,2941	1,4	1,1	0,7941	2,0924

10a	0,4360	1,0563	1,478	1,435	4,6550	50,8806	3,7856	2,7856	1,4	1,1	0,2856	1,5323
W TOTAL LAPISAN I+II+III												
10b	0,0570	1,0563	1,487	1,435	4,9015	54,7773	3,4605	2,4605	1,4	1,061	0	0,1742
11	0,4930	1,0563	1,487	1,435	5,1765	59,6268	3,0338	2,0338	1,4	0,634	0	1,1937
12a	0,0760	1,0563	1,487	1,435	5,4610	65,5284	2,4855	1,4855	1,4	0,085	0	0,1220
W TOTAL LAPISAN I+II												
12b	0,4170	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,8505	0	0	0,3746
W TOTAL LAPISAN I												

Tabel 5.28 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 60^0 dengan jumlah pias 12 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,300	F1	1,287	F2	1,284	F0	1,300	F1	1,287	F2	1,284
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0104	0,0123	0,2091	0,219	1,02130		1,02153		1,02159		0,21487		0,21482		0.21481	
0,0104	0,1077	0,61215	0,623	1,05882		1,05949		1,05967		0,58792		0,58755		0,58745	
0,0096	0,2632	0,91033	0,920	1,08842		1,08953		1,08982		0,84520		0,84434		0,84411	
0,0010	0,0293	0,08415	0,085	1,10116		1,10249		1,10285		0,07732		0,07723		0,07720	
0,0137	0,5603	1,3644	1,378	1,11276		1,11434		1,11475		1,23843		1,23668		1,23622	
0,0032	0,1061	0,2901	0,293	1,10470		1,10610		1,10647		0,26551		0,26517		0,26508	
0,0123	0,7088	1,30841	1,321	1,12971		1,13178		1,13233		1,16904		1,16690		1,16633	
0,0137	1,0917	1,71421	1,728	1,13539		1,13783		1,13847		1,52188		1,51861		1,51775	
0,0023	0,1941	0,27913	0,281	1,13584		1,13851		1,13921		0,24777		0,24719		0,24704	
0,0160	1,4122	1,8517	1,868	1,13323		1,13616		1,13693		1,64813		1,64389		1,64278	
0,0160	1,4779	1,67957	1,696	1,11960		1,12297		1,12386		1,51447		1,50992		1,50873	
0,0160	1,4618	1,46588	1,482	1,09197		1,09580		1,09680		1,35709		1,35236		1,35111	
0,0142	1,1892	1,0735	1,088	1,04888		1,05313		1,05425		1,03698		1,03280		1,03171	

4	0,4930	1,0563	1,487	1,435	1,1969	11,5067	5,8794	5,9525	0	0,489	5,4639	4,2237	0,8429	4,1387
5a	0,1155	1,0563	1,487	1,435	1,5368	14,8403	5,7999	2,46159	0	1,016	1,4460	0,4141	0,1061	0,4003
W TOTAL LAPISAN II+III														4,6555
5b	0,3775	1,0563	1,487	1,435	2,2763	22,2950	5,5515	2,6401	0,3269	1,1	1,2132	1,4051	0,5332	1,2999
6a	0,4220	1,0563	1,487	1,435	2,6760	26,4873	5,3702	3,9435	1,0193	1,1	1,8242	2,2493	1,0036	2,0130
6b	0,0710	1,0563	1,487	1,435	2,9225	29,1491	5,2401	4,2401	1,4	1,1	1,7401	0,3984	0,1941	0,3479
7	0,4930	1,0563	1,478	1,435	3,2045	32,2818	5,0726	4,0726	1,4	1,1	1,5726	2,6431	1,4122	2,2343
8	0,4930	1,0563	1,478	1,435	3,6975	38,0428	4,7253	3,7253	1,4	1,1	1,2253	2,3974	1,4779	1,8877
9	0,4930	1,0563	1,478	1,435	4,1905	44,3001	4,2941	3,2941	1,4	1,1	0,7941	2,0924	1,4618	1,4971
10a	0,4360	1,0563	1,478	1,435	4,6550	50,8806	3,7856	2,7856	1,4	1,1	0,2856	1,5323	1,1892	0,9664
W TOTAL LAPISAN I+II+III														10,2463
10b	0,0570	1,0563	1,487	1,435	4,9015	54,7773	3,4605	2,4605	1,4	1,061	0	0,1742	0,1423	0,1004
11	0,4930	1,0563	1,487	1,435	4,2134	44,6065	4,2717	3,2717	1,4	1,872	0	2,1012	1,4760	1,4955
12a	0,0760	1,0563	1,487	1,435	5,4610	65,5284	2,4855	1,4855	1,4	0,085	0	0,1220	0,1111	0,0505
W TOTAL LAPISAN I+II														1,6464
12b	0,4170	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,851	0	0	0,3746	0,3564	0,1154
W TOTAL LAPISAN I													10,7193	0,1154

Tabel 5.30 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 60^0 dengan jumlah pias 14

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	4,89	5
E	0	0
F	7,499	3,6
G	6,873	2,5

L OC = R	6,000
L BC	5,916
L CD	3,029
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,280
F1	1,277
F2	1,276

H	7,916	6
O	2	6

F3	1,276

pias ke	B	γ1	γ2	γ3	xi	ϑ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,4226	1,0563	1,487	1,435	0,2113	2,0182	5,9963	0,3623	0	0	0,3623	0,2197
2	0,4226	1,0563	1,487	1,435	0,6339	6,0646	5,9664	1,0644	0	0	1,0644	0,6455
3	0,4226	1,0563	1,487	1,435	1,0565	10,1417	5,9063	1,7362	0	0	1,7362	1,0529
4a	0,1756	1,0563	1,487	1,435	1,3556	13,0578	5,8449	2,1928	0	0	2,1928	0,5526
W TOTAL LAPISAN III												
4b	0,2470	1,0563	1,487	1,435	1,3913	13,4080	5,8365	2,2463	0	0,214	2,0324	0,7989
5a	0,3881	1,0563	1,487	1,435	1,8845	18,3050	5,6964	2,9604	0	0,764	2,1964	1,6641
W TOTAL LAPISAN II+III												
5b	0,0345	1,0563	1,487	1,435	2,0958	20,4440	5,6221	3,2520	0,030	1,1	2,1222	0,1626
6	0,4226	1,0563	1,487	1,435	2,3243	22,7918	5,5315	3,1934	0,426	1,1	1,6677	1,8926
7a	0,3514	1,0563	1,487	1,435	2,7113	26,8646	5,3525	4,3525	1,4	1,1	1,8525	2,0286
7b	0,0712	1,0563	1,478	1,435	2,9226	29,1502	5,2401	4,2401	1,4	1,1	1,7401	0,3988
8	0,4226	1,0563	1,478	1,435	3,1695	31,8873	5,0945	4,0945	1,4	1,1	1,5945	2,2790
9	0,4260	1,0563	1,478	1,435	3,5938	36,7959	4,8046	3,8046	1,4	1,1	1,3046	2,1201
10	0,4226	1,0563	1,478	1,435	4,0181	42,0426	4,4559	3,4559	1,4	1,1	0,9559	1,8917
11	0,4226	1,0563	1,478	1,435	4,4407	47,7414	4,0349	3,0349	1,4	1,1	0,5349	1,6364
12a	0,2244	1,0563	1,478	1,435	4,7642	52,5640	3,6472	2,6472	1,4	1,1	0,1472	0,7441
W TOTAL LAPISAN I+II+III												
12b	0,1982	1,0563	1,487	1,435	4,9755	56,0218	3,3533	2,3533	1,4	0,953	0	0,5741
13	0,4226	1,0563	1,487	1,435	5,2859	61,7612	2,8389	1,8389	1,4	0,439	0	0,9007
14a	0,0018	1,0563	1,487	1,435	5,4981	66,3982	2,4023	1,4023	1,4	0,002	0	0,0027
W TOTAL LAPISAN I+II												

14b	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,851	0	0	0,3746
W TOTAL LAPISAN I												

Tabel 5.30 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 60^0 dengan jumlah pias 14 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,280	F1	1,277	F2	1,276	F0	1,280	F1	1,277	F2	1,276
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0089	0,0077	0,15391	0,163	1,01866		1,01871		1,01873		0,15980		0,15979		0,15979	
0,0089	0,0682	0,4522	0,461	1,05225		1,05240		1,05244		0,43818		0,43811		0,43810	
0,0089	0,1855	0,73761	0,746	1,08078		1,08103		1,08110		0,69069		0,69053		0,69049	
0,0037	0,1249	0,38711	0,391	1,09783		1,09816		1,09824		0,35597		0,35587		0,35584	
0,0069	0,1853	0,55971	0,567	1,09969		1,10002		1,10011		0,51520		0,51504		0,51500	
0,0108	0,5229	1,16583	1,177	1,12133		1,12178		1,12190		1,04929		1,04887		1,04876	
0,0011	0,0568	0,1139	0,115	1,12821		1,12872		1,12885		0,10195		0,10191		0,10189	
0,0137	0,7335	1,32592	1,340	1,13396		1,13452		1,13467		1,18140		1,18081		1,18066	
0,0114	0,9170	1,42116	1,433	1,13941		1,14006		1,14023		1,25730		1,25658		1,25639	
0,0023	0,1943	0,27941	0,282	1,13995		1,14065		1,14083		0,24714		0,24699		0,24695	
0,0137	1,2043	1,5966	1,610	1,13820		1,13896		1,13916		1,41481		1,41386		1,41361	
0,0138	1,2703	1,48529	1,499	1,12856		1,12942		1,12965		1,32836		1,32735		1,32708	
0,0137	1,2672	1,32527	1,339	1,10910		1,11007		1,11032		1,20728		1,20624		1,20596	
0,0137	1,2115	1,1464	1,160	1,07744		1,07850		1,07879		1,07676		1,07569		1,07541	
0,0073	0,5910	0,52129	0,529	1,04230		1,04344		1,04374		0,50713		0,50658		0,50643	
0,0076	0,4762	0,44875	0,456	1,06512		1,06645		1,06681		0,42843		0,42789		0,42775	
0,0162	0,7937	0,70413	0,720	1,01092		1,01234		1,01271		0,71251		0,71151		0,71125	
0,0000	0,0024	0,00187	0,002	0,95969		0,96117		0,96156		0,00200		0,00200		0,00200	

0,0175	0,3564	0,19929	0,217	0,70334	0,70438	0,70466	0,30825	0,30780	0,30768
	10,1692						12,98246	12,97343	12,97103

Tabel 5.31 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 60^0 dengan jumlah pias 14

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	4,89	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

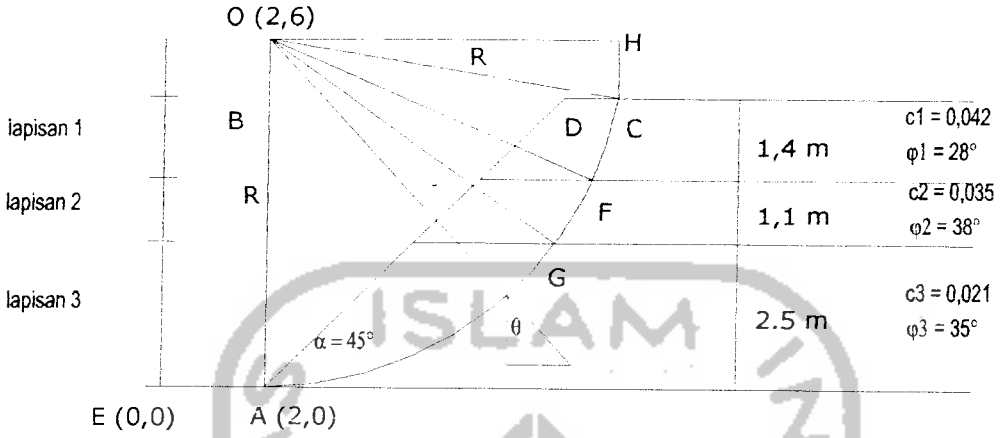
L OC = R	6,000
L BC	5,916
L CD	3,029
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
ΣW cos α x tgn φ	11,149
F	1,114

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin α	W cos α
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,4226	1,0563	1,487	1,435	0,2113	2,0182	5,9963	0,3623	0	0	0,3623	0,2197	0,0077	0,2195
2	0,4226	1,0563	1,487	1,435	0,6339	6,0646	5,9664	1,0644	0	0	1,0644	0,6455	0,0682	0,6418
3	0,4226	1,0563	1,487	1,435	1,0565	10,1417	5,9063	1,7362	0	0	1,7362	1,0529	0,1855	1,0364
4a	0,1756	1,0563	1,487	1,435	1,3556	13,0578	5,8449	2,1928	0	0	2,1928	0,5526	0,1249	0,5383
W TOTAL LAPISAN III														1,8978
4b	0,2470	1,0563	1,487	1,435	1,3913	13,4080	5,8365	2,2463	0	0,214	2,0324	0,7989	0,1853	0,7771
5a	0,3881	1,0563	1,487	1,435	1,8845	18,3050	5,6964	2,9604	0	0,764	2,1964	1,6641	0,5229	1,5798
W TOTAL LAPISAN II+III														2,3570
5b	0,0345	1,0563	1,487	1,435	2,0958	20,4440	5,6221	3,2520	0,030	1,1	2,1222	0,1626	0,0568	0,1523

5.5 Perhitungan Untuk Sudut Kemiringan 45^0



Gambar 5.5 Koordinat dan bidang longsor pada sudut 45^0

Hitungan stabilitas lereng dengan sudut 60^0 dan jumlah pias 6.

Menentukan koordinat awal, titik A = (2,0) dan O = (2,6).

Koordinat E = (0,0); koordinat B didapat (2,5) dan koordinat D = (7,5).

Panjang OB = $L\overline{OB}$ = 1 m, $L\overline{OA}$ = R = 6 m.

$L\overline{BC} = \sqrt{L\overline{OA}^2 - L\overline{OB}^2} = \sqrt{6^2 - 1^2}$ = 5,916 m.

Koordinat C (XC,YC):

XC = $L\overline{BC}$ + 2 = 5,916 + 2 = 7,916 m ; YC = 5,0 m.

Jadi koordinat C (7,916;5).

Koordinat D (XD,YD)

YD = 5

$$XD = \frac{YD}{\tan\alpha} + 2 = \frac{5}{\tan 45} + 2 = 5 + 2 = 7$$

6	0,4226	1,0563	1,487	1,435	2,3243	22,7918	5,5315	3,5573	0,426	1,1	2,0316	2,1133	0,8190	1,9482
7a	0,3514	1,0563	1,487	1,435	2,7113	26,8646	5,3525	4,0486	1,096	1,1	1,8525	1,9158	0,8660	1,7089
7b	0,0712	1,0563	1,478	1,435	2,9226	29,1502	5,2401	4,2401	1,4	1,1	1,7401	0,3988	0,1943	0,3483
8	0,4226	1,0563	1,478	1,435	3,1695	31,8873	5,0945	4,0945	1,4	1,1	1,5945	2,2790	1,2043	1,9348
9	0,4260	1,0563	1,478	1,435	3,5938	36,7959	4,8046	3,8046	1,4	1,1	1,3046	2,1201	1,2703	1,6974
10	0,4226	1,0563	1,478	1,435	4,0181	42,0426	4,4559	3,4559	1,4	1,1	0,9559	1,8917	1,2672	1,4045
11	0,4226	1,0563	1,478	1,435	4,4407	47,7414	4,0349	3,0349	1,4	1,1	0,5349	1,6364	1,2115	1,1000
12a	0,2244	1,0563	1,478	1,435	4,7642	52,5640	3,6472	2,6472	1,4	1,1	0,1472	0,7441	0,5910	0,4521
W TOTAL LAPISAN I+II+III														10,7464
12b	0,1982	1,0563	1,487	1,435	4,9755	56,0218	3,3533	2,3533	1,4	0,953	0	0,5741	0,4762	0,3206
13	0,4226	1,0563	1,487	1,435	5,2859	61,7612	2,8389	1,8389	1,4	0,439	0	0,9007	0,7937	0,4258
14a	0,0018	1,0563	1,487	1,435	5,4981	66,3982	2,4023	1,4023	1,4	0,002	0	0,0027	0,0024	0,0011
W TOTAL LAPISAN I+II														0,7465
14b	0,417	1,0563	1,487	1,435	5,7057	71,9803	1,8561	0,8561	0,856	0	0	0,3771	0,3586	0,1165
W TOTAL LAPISAN I													10,2060	0,1165

Jadi koordinat D (7;5).

$L\overline{CD}$ = XC – XD = 7,916 – 7 = 0,916 m.

Koordinat E didapat: (0,0).

$L\overline{OB}$ = YO – YB = 6 – 5 = 1 m.

$L\overline{OC}$ = R $= \sqrt{(XA-XO)^2+(YA-YO)^2} = \sqrt{(2-2)^2+(2-6)^2} = 6$ m.

$L\overline{OA}$ = R = 6 m

$L\overline{OE}$ = YO – YE = 6 - 0 = 6 m

$L\overline{EA}$ = XA – XE = 2 – 0 = 2 m.

Koordinat F:

XF $= \sqrt{\left(L\overline{OA}\right)^2+\left(L\overline{OE}-YF\right)^2}+2 = \sqrt{(6)^2+(6-3{,}6)^2}+2 = 5{,}499+2 = 7{,}499$ m.

YF $= H_2 + H_3 = 2{,}5 + 1{,}1 = 3{,}6$ m.

Jadi koordinat F: (7,499;3,6).

Koordinat G:

XG $= \sqrt{\left(L\overline{OA}\right)^2+\left(L\overline{OE}-YG\right)^2}+2 = \sqrt{(6)^2+(6-2{,}5)^2}+2 = 4{,}873+2 = 6{,}873$ m.

YG $= H_3 = 2{,}5$ m.

Jadi koordinat G: (6,873;2,5).

Koordinat H: (XC,YO) = (7,916;6).

$\angle$ COB $= \text{arc tan}\ \dfrac{L\overline{BC}}{L\overline{OB}} = \text{arc tan}\ \dfrac{6}{1} = 80{,}406^0.$

$\angle$ AOC $= \angle$ COB $= 80{,}406^0.$

$\angle$ COF $= 2 \times \text{arc sin}\left(\dfrac{\left(\sqrt{(XC-XF)^2+(YC-YF)^2}/2\right)}{R}\right) = 13{,}984^0.$

$\angle$ FOG $= 2 \text{ x arc sin} \left(\frac{\left(\sqrt{(XF - XG)^2 + (YF - YG)^2} / 2 \right)}{R} \right) = 12{,}107^0.$

$\angle$ GOA $= \text{arc sin} \left(\frac{\left(\sqrt{(XG - XA)^2 + (YG - YA)^2} / 2 \right)}{R} \right) = 54{,}315^0.$

$L\overline{CF} = \frac{\angle COF}{360} \text{ x } 2\pi \text{ x R} = 1{,}464 \text{ m.}$

$L\overline{FG} = \frac{\angle COF}{360} \text{ x } 2\pi \text{ x R} = 1{,}268 \text{ m.}$

$L\overline{GA} = \frac{\angle COF}{360} \text{ x } 2\pi \text{ x R} = 5{,}688 \text{ m.}$

$\varphi_1 = 28; \quad \varphi_2 = 38; \quad \varphi_3 = 35.$

$c_1 = 0{,}042; \quad C_2 = 0{,}035; \quad C_3 = 0{,}021.$

Lebar tiap pias $= \frac{L\overline{CD}}{6} = 0{,}986 \text{ m.}$

Hitungan untuk pias 1a dengan metode Bishop:

$x_1 = \frac{1}{2} \text{ x } B_1 = \frac{1}{2} \text{ x } 0{,}986 = 0{,}4930 \text{ m.}$

$\theta_1 = \text{arc sin} \frac{x_1}{R} = 4{,}7131^0.$

$y_1 = \frac{x_1}{\tan \theta_1} = 5{,}9797 \text{ m.}$

$h_1 = (x_1 \tan \alpha) - (L\overline{OE} - y_1 a) = 0{,}4727 \text{ m.}$

$W = (B_{1a} \text{ x } h_1 \text{ x } \gamma_1) + (B_{1a} \text{ x } h_2 \text{ x } \gamma_2) + (B_{1a} \text{ x } h_3 \text{ x } \gamma_3)$

$= (0{,}670 \text{ x } 0 \text{ x } 1{,}0563) + (0{,}670 \text{ x } 0 \text{ x } 1{,}487) + (0{,}670 \text{ x } 0{,}4727 \text{ x } 1{,}435)$

$= 0{,}6688 \text{ t/m}$

$C_r \text{ x } B_1 = C_3 \text{ x } B_{1a} = 0{,}0207 \text{ t/m.}$

$W \sin \theta_1 = 0{,}6688 \sin (4{,}7131^0) = 0{,}0550$ t/m.

$W \tan \varphi_3 = 0{,}6688 \tan 35^0 = 0{,}4686$ t/m.

$(c_1 \times B_1) + W \tan \varphi_3 = 0{,}489$ t/m.

Untuk mencari F dilakukan dengan iterasi yang berulang (trial and error).

Dicari M dengan F coba-coba,

$F_0 = 1{,}116$ didapat M_1 pada lapis 1 = 1,04626.

$((c_1 \times B_{1a}) + W \tan \varphi_3)/ M_1 = 0{,}46765$ (pada lapis 1).

$F_1 = (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_1)/(\Sigma W \sin \theta_1) = 1{,}213.$

Dari F_1 didapat $M_2 = 1{,}04411$ (pada lapis 1)

$((c_1 \times B_1) + W \tan \varphi_3)/ M_2 = 0{,}46861.$

$F_2 = (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_2)/ (\Sigma W \sin \theta_1) = 1{,}176.$

Dari F_2 didapat $M_3 = 1{,}04557.$

$((c_1 \times B_i) + W \tan \varphi_3)/ M_3 = 0.46796.$

$F_3 = (\Sigma((c_1 \times B_1) + W \tan \varphi_3)/ M_3)/ (\Sigma W \sin \theta_1) = 1{,}166.$

Karena nilai F_3 mendekati F_2, iterasi dihentikan dan didapat nilai F =1,166.

Hitungan untuk pias ke 1 dengan metode Fellinius:

$x_1 = \frac{1}{2} \times B_1 = \frac{1}{2} \times 0{,}986 = 0{,}4930$ m.

$\theta_1 = \text{arc sin } \frac{x_1}{R} = 4{,}7131^0.$

$y_1 = \frac{x_1}{\tan \theta_1} = 5{,}9797$ m.

$h_1 = (x_1 \tan \alpha) - (L\overline{OE} - y_1 a) = 0{,}4727$ m.

$W = (B_{1a} \times h_1 \times \gamma_1) + (B_{1a} \times h_2 \times \gamma_2) + (B_{1a} \times h_3 \times \gamma_3)$

$= (0{,}670 \times 0 \times 1{,}0563) + (0{,}670 \times 0 \times 1{,}487) + (0{,}670 \times 0{,}4727 \times 1{,}435)$

= 0,6688 t/m.

$W \sin \theta_1$ = 0,6688 sin ($4,7131^0$) = 0,00550 t/m.

$W \cos \theta_1$ = 0,6688 cos ($4,7131^0$) = 0,6666 t/m.

$\Sigma W \sin \theta$ = 7,4614 t/m.

$\Sigma W \cos \theta$ untuk lap. III = 3,7090 t/m.

$\Sigma W \cos \theta$ untuk lap. II + III = 3,0171 t/m.

$\Sigma W \cos \theta$ untuk lap. I + II + III = 3,0183 t/m.

$\Sigma W \cos \theta$ untuk lap. I + II = 0,7494 t/m.

$\Sigma W \cos \theta$ untuk lap. I = 0,1155 t/m.

$L\overline{AC} \times c = (L\overline{CF} \times c_1) + (L\overline{FG} \times c_2) + (L\overline{GA} \times c_3) = 0,225$ m.

$W \cos \theta \times \tan \varphi = = 7,470$ t/m.

F = $((L\overline{AC} \times c) + (W \cos \theta \times \tan \varphi))/(\Sigma W \sin \theta) = (0,225 + 7,470)/7,4614$

= 1,031.

Tabel 5.32 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 45^0 dengan jumlah pias 6

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	7	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	0,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,160
F1	1,213
F2	1,176
F3	1,166

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,986	1,0563	1,487	1,435	0,4930	4,7131	5,9797	0,4727	0	0	0,4727	0,6688
2	0,986	1,0563	1,487	1,435	1,4790	14,2705	5,8149	1,2939	0	0	1,2939	1,8307
3a	0,528	1,0563	1,487	1,435	2,2360	21,8802	5,5678	1,8038	0	0	1,8038	1,3667
W TOTAL LAPISAN III												
3b	0,458	1,0563	1,487	1,435	2,7290	27,0542	5,3435	2,0725	0	0,2290	1,8435	1,3675
4a	0,642	1,0563	1,487	1,435	3,2790	33,1272	5,0248	2,3038	0	0,3633	1,9405	2,1345
W TOTAL LAPISAN II+III												
4b	0,344	1,0563	1,487	1,435	3,7720	38,9518	4,6660	2,4380	0,172	1,1	1,1660	1,2008
5a	0,929	1,0563	1,487	1,435	4,4085	47,2861	4,0700	2,4785	0,8085	1,1	0,5700	3,0729
W TOTAL LAPISAN I+II+III												
5b	0,057	1,0563	1,487	1,435	4,9015	54,7773	3,4605	2,3620	1,3015	1,0605	0	0,1683
6a	0,070	1,0563	1,487	1,435	4,965	55,8428	3,3688	2,3338	1,365	0,9688	0	0,2018

Tabel 5.33 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 45^0 dengan jumlah pias 6

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	7	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	0,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	7,470
F	1,031

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,986	1,0563	1,487	1,435	0,4930	4,7131	5,9797	0,4727	0	0	0,4727	0,6688	0,0550	0,6666
2	0,986	1,0563	1,487	1,435	1,4790	14,2705	5,8149	1,2939	0	0	1,2939	1,8307	0,4514	1,7742
3a	0,528	1,0563	1,487	1,435	2,2360	21,8802	5,5678	1,8038	0	0	1,8038	1,3667	0,5095	1,2682
W TOTAL LAPISAN III														3,7090
3b	0,458	1,0563	1,487	1,435	2,7290	27,0542	5,3435	2,0725	0	0,2290	1,8435	1,3675	0,6222	1,2179
4a	0,642	1,0563	1,487	1,435	3,2790	33,1272	5,0248	2,3038	0	0,7790	1,5248	2,1484	1,1745	1,7992
W TOTAL LAPISAN II+III														3,0171
4b	0,344	1,0563	1,487	1,435	3,7720	38,9518	4,6660	2,4380	0,172	1,1	1,1660	1,2008	0,7552	0,9338
5a	0,929	1,0563	1,487	1,435	4,4085	47,2861	4,0700	2,4785	0,8085	1,1	0,5700	3,0729	2,2585	2,0844
W TOTAL LAPISAN I+II+III														3,0183
5b	0,057	1,0563	1,487	1,435	4,9015	54,7773	3,4605	2,3620	1,3015	1,061	0	0,1683	0,1375	0,0970
6a	0,070	1,0563	1,487	1,435	4,9650	55,8428	3,3688	2,3338	1,365	0,959	0	0,2018	0,1670	0,1133
6b	0,499	1,0563	1,487	1,435	5,2495	61,0351	2,9056	1,9056	1,4	0,506	0	1,11312	0,97412	0,53906

5b	0,0975	1,0563	1,487	1,435	3,6488	37,454	4,7630	2,4118	0,0488	1,1	1,2630	0,3412
6	0,7395	1,0563	1,487	1,435	4,0673	42,678	4,4111	2,4783	0,4673	1,1	0,9111	2,5414
7a	0,4360	1,0563	1,487	1,435	4,6550	50,881	3,7856	2,4406	1,0550	1,1	0,2856	1,3777
W TOTAL LAPISAN I+II+III												
7b	0,1270	1,0563	1,478	1,435	4,9365	55,361	3,4104	2,3469	1,3365	1,0104	0	0,3690
7c	0,1765	1,0563	1,478	1,435	5,0883	57,999	3,1796	2,1796	1,4	0,7796	0	0,4644
8a	0,3225	1,0563	1,487	1,435	5,0343	57,039	3,2644	2,2644	1,4	0,8644	0	0,8915
W TOTAL LAPISAN I+II												
8c	0,417	1,0563	1,487	1,435	5,7075	72,036	1,8505	0,8505	0,851	0	0	0,3746
W TOTAL LAPISAN I												

Tabel 5.34 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 45^0 dengan jumlah pias 8 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,140	F1	1,140	F2	1,141	F0	1,140	F1	1,140	F2	1,141
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0155	0,0234	0,26641	0,282	1,03598		1,03597		1,03596		0,27214		0,27215		0,27215	
0,0155	0,1974	0,74777	0,763	1,09641		1,09636		1,09635		0,69618		0,69621		0,69622	
0,0155	0,5092	1,1574	1,173	1,14074		1,14066		1,14064		1,02822		1,02829		1,02831	
0,0059	0,2981	0,53089	0,537	1,16112		1,16102		1,16099		0,46231		0,46235		0,46236	
0,0127	0,6222	0,95806	0,971	1,17011		1,17000		1,16996		0,82964		0,82972		0,82974	
0,0178	1,1745	1,5051	1,523	1,17330		1,17316		1,17312		1,29798		1,29813		1,29817	
0,0032	0,2076	0,23905	0,242	1,16753		1,16738		1,16733		0,20746		0,20749		0,20750	
0,0240	1,7233	1,78043	1,804	1,15169		1,15153		1,15147		1,56680		1,56702		1,56709	
0,0142	1,0692	0,96521	0,979	1,10758		1,10739		1,10733		0,88426		0,88441		0,88445	
0,0049	0,3036	0,25848	0,263	1,13241		1,13219		1,13212		0,23255		0,23259		0,23261	

H	7,916	6
O	2	6

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,5916	1,0563	1,487	1,435	0,2958	2,8258	5,9927	0,2885	0	0	0,2885	0,2449	0,0121	0,2446
2	0,5916	1,0563	1,487	1,435	0,8874	8,5052	5,9340	0,8214	0	0	0,8214	0,6973	0,1032	0,6897
3	0,5916	1,0563	1,487	1,435	1,4790	14,2705	5,8149	1,2939	0	0	1,2939	1,0984	0,2709	1,0645
4	0,5916	1,0563	1,487	1,435	2,0706	20,1879	5,6314	1,7020	0	0	1,7020	1,4449	0,4988	1,3561
5a	0,1336	1,0563	1,487	1,435	2,4332	23,9246	5,4845	1,9177	0	0	1,9177	0,3677	0,1492	0,3360
W TOTAL LAPISAN III														1,9988
5b	0,4580	1,0563	1,487	1,435	2,7290	27,0542	5,3435	2,0725	0	0,229	1,8435	1,3675	0,6222	1,2178
6	0,5916	1,0563	1,487	1,435	3,2538	32,8403	5,0411	2,2949	0	0,754	1,5411	1,9714	1,0695	1,6561
7a	0,0504	1,0563	1,487	1,435	2,9832	29,8149	5,2058	2,1890	0	1,075	1,1142	0,1611	0,0801	0,1398
W TOTAL LAPISAN II+III														2,8739
7b	0,5412	1,0563	1,487	1,435	3,8706	40,1732	4,5846	2,4552	0,271	1,1	1,0846	1,8823	1,2146	1,4379
8	0,5916	1,0563	1,487	1,435	4,4370	47,6888	4,0389	2,4759	0,837	1,1	0,5389	1,9483	1,4412	1,3110
9a	0,1402	1,0563	1,487	1,435	4,8029	53,1763	3,5961	2,3990	1,203	1,1	0,0961	0,4268	0,3417	0,2557
W TOTAL LAPISAN I+II+III														3,0046
9b	0,1270	1,0563	1,487	1,435	4,9365	55,3610	3,4104	2,3469	1,337	1,010	0	0,3701	0,3046	0,2103
9c	0,3244	1,0563	1,487	1,435	5,1622	59,3578	3,0581	2,058	1,4	0,658	0	0,7972	0,6860	0,4060
10a	0,1746	1,0563	1,487	1,435	5,4117	64,4156	2,5910	1,591	1,4	0,191	0	0,3078	0,2777	0,1328
W TOTAL LAPISAN I+II														0,2103
10c	0,4170	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,851	0,851	0	0	0,3746	0,3564	0,1154
W TOTAL LAPISAN I													5,7364	0,1154

6b	0,499	1,0563	1,487	1,435	5,2495	61,0351	2,9056	1,9056	1,4	0,5056	0	1,1131
W TOTAL LAPISAN I+II												
6c	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,8505	0	0	0,3746
W TOTAL LAPISAN I												

Tabel 5.32 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 45^0 dengan jumlah pias 6 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,160	F1	1,213	F2	1,176	F0	1,160	F1	1,213	F2	1,176
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0207	0,0550	0,46858	0,489	1,04626		1,04411		1,04557		0,46765		0,46861		0,46796	
0,0207	0,4514	1,28253	1,303	1,00022		1,11160		1,11598		1,30296		1,17240		1,16780	
0,0111	0,5095	0,95747	0,969	1,00012		1,14331		1,14993		0,96845		0,84715		0,84228	
0,0127	0,6222	0,95806	0,971	1,16529		1,15338		1,16146		0,83307		0,84167		0,83582	
0,0178	1,1669	1,49538	1,513	1,16750		1,15320		1,16291		1,29609		1,31217		1,30122	
0,0112	0,7552	0,84124	0,852	1,15731		1,14086		1,15202		0,73655		0,74717		0,73993	
0,0302	2,2585	2,15277	2,183	1,12198		1,10275		1,11580		1,94564		1,97956		1,95641	
0,0019	0,1375	0,11787	0,120	1,06995		1,04857		1,06308		0,11190		0,11418		0,11262	
0,0023	0,1670	0,14136	0,144	0,56114		1,03939		1,05408		0,25596		0,13819		0,13626	
0,0191	0,9741	0,87015	0,889	1,07364		1,04810		1,06543		0,82824		0,84843		0,83462	
0,0175	0,3564	0,19929	0,217	0,74424		0,72535		0,73817		0,29131		0,29890		0,29371	
	7,4538									9,03782		8,76843		8,68863	

W TOTAL LAPISAN I+II														0,7494
6c	0,417	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,8505	0	0	0,3746	0,3564	0,1155
W TOTAL LAPISAN I													7,4614	0,1155

Tabel 5.34 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 45^0 dengan jumlah pias 8

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	7	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	0,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,140
F1	1,140
F2	1,141
F3	1,141

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,7395	1,0563	1,487	1,435	0,3698	3,533	5,9886	0,3583	0	0	0,3583	0,3803
2	0,7395	1,0563	1,487	1,435	1,1093	10,654	5,8966	1,0058	0	0	1,0058	1,0674
3	0,7395	1,0563	1,487	1,435	1,8488	17,946	5,7081	1,5568	0	0	1,5568	1,6521
4a	0,2815	1,0563	1,487	1,435	2,3593	23,154	5,5167	1,8759	0	0	1,8759	0,7578
W TOTAL LAPISAN II+III												
4b	0,4580	1,0563	1,487	1,435	2,7290	27,054	5,3435	2,0725	0	0,229	1,8435	1,3675
5a	0,6420	1,0563	1,487	1,435	3,2790	33,127	5,0248	2,3038	0	0,779	1,5248	2,1484
W TOTAL LAPISAN II+III												

0,0068	0,3939	0,32533	0,332	1,11125	1,11102	1,11095	0,29884	0,29890	0,29892
0,0123	0,7482	0,69686	0,709	1,11922	1,11900	1 11893	0,63365	0,63378	0,63382
0,0175	0,3564	0,19929	0,217	0,75190	0,75172	0,75167	0,28835	0,28841	0,28843
	7,6272						8,69838	8,69945	8,69978

Tabel 5.35 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 45^0 dengan jumlah pias 8

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	7	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	0,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	7,320
F	1,069

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,7395	1,0563	1,487	1,435	0,3698	3,533	5,9886	0,3583	0	0	0,3583	0,3803	0,0234	0,3795
2	0,7395	1,0563	1,487	1,435	1,1093	10,654	5,8966	1,0058	0	0	1,0058	1,0674	0,1974	1,0489
3	0,7395	1,0563	1,487	1,435	1,8488	17,946	5,7081	1,5568	0	0	1,5568	1,6521	0,5092	1,5716
4a	0,2815	1,0563	1,487	1,435	2,3593	23 154	5,5167	1,8759	0	0	1,8759	0,7578	0,2981	0,6967
W TOTAL LAPISAN III														3,6968
4b	0,4580	1,0563	1,487	1,435	2,7290	27,054	5,3435	2,0725	0	0,229	1,8435	1,3675	0,6222	1,2178
5a	0,6420	1,0563	1,487	1,435	2,5395	25,040	5,4361	1,9756	0	0,779	1,1966	1,8460	0,7816	1,6724

W TOTAL LAPISAN II+III														2,8902
5b	0,0975	1,0563	1,487	1,435	3,6488	37,454	4,7630	2,4118	0,0488	1,1	1,2630	0,3412	0,2076	0,2708
6	0,7395	1,0563	1,487	1,435	4,0673	42,678	4,4111	2,4783	0,4673	1,1	0,9111	2,5414	1,7233	1,8679
7a	0,4360	1,0563	1,487	1,435	4,6550	50,881	3,7856	2,4406	1,0550	1,1	0,2856	1,3777	1,0692	0,8689
W TOTAL LAPISAN I+II+III														3,0076
7b	0,1270	1,0563	1,487	1,435	4,9365	55,361	3,4104	2,3469	1,3365	1,010	0	0,3701	0,3046	0,2103
7c	0,1765	1,0563	1,487	1,435	5,0883	57,999	3,1796	2,1796	1,4	0,780	0	0,4656	0,3950	0,2466
8a	0,3225	1,0563	1,487	1,435	5,3378	62,826	2,7402	1,7402	1,4	0,340	0	0,6400	0,5695	0,2921
W TOTAL LAPISAN I+II														0,7489
8c	0,417	1,0563	1,487	1,435	5,7075	72,036	1,8505	0,851	0,851	0	0	0,3746	0,3564	0,1154
W TOTAL LAPISAN I													7,0576	0,1154

Tabel 5.36 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 45^0 dengan jumlah pias 10

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	7	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	0,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,400
F1	1,245
F2	1,208
F3	1,200

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12

1	0,5916	1,0563	1,487	1,435	0,2958	2,8258	5,9927	0,2885	0	0	0,2885	0,2449
2	0,5916	1,0563	1,487	1,435	0,8874	8,5052	5,9340	0,8214	0	0	0,8214	0,6973
3	0,5916	1,0563	1,487	1,435	1,4790	14,2705	5,8149	1,2939	0	0	1,2939	1,0984
4	0,5916	1,0563	1,487	1,435	2,0706	20,1879	5,6314	1,7020	0	0	1,7020	1,4449
5a	0,1336	1,0563	1,487	1,435	2,4332	23,9246	5,4845	1,9177	0	0	1,9177	0,3677
W TOTAL LAPISAN III												
5b	0,4580	1,0563	1,487	1,435	2,7290	24,4576	5,3435	2,0725	0	0,229	1,8435	1,3675
6	0,5916	1,0563	1,487	1,435	3,2538	28,4710	5,0411	2,2949	0	0,754	1,5411	1,9714
7a	0,0504	1,0563	1,487	1,435	3,5748	30,7865	4,8188	2,3936	0	1,075	1,3188	0,1759
W TOTAL LAPISAN II+III												
7b	0,5412	1,0563	1,487	1,435	3,8706	40,1732	4,5846	2,4552	0,271	1,1	1,0846	1,8823
8	0,5916	1,0563	1,487	1,435	4,4370	47,6888	4,0389	2,4759	0,837	1,1	0,5389	1,9483
9a	0,1402	1,0563	1,487	1,435	4,8029	53,1763	3,5961	2,3990	1,203	1,1	0,0961	0,4268
W TOTAL LAPISAN I+II+III												
9b	0,1270	1,0563	1,487	1,435	4,9365	55,3610	3,4104	2,3469	1,337	1,010	0	0,3701
9c	0,3244	1,0563	1,487	1,435	4,5706	49,6202	3,8871	2,8871	1,4	1,487	0	1,1971
10a	0,1746	1,0563	1,487	1,435	4,2285	44,8094	4,2567	3,2567	1,4	1,857	0	0,7403
W TOTAL LAPISAN I÷II												
10c	0,4170	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,851	0	0	0,3746
W TOTAL LAPISAN I												

Tabel 5.36 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 45^0 dengan jumlah pias 10 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,400	F1	1,245	F2	1,208	F0	1,400	F1	1,245	F2	1,208
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0124	0,0121	0,17159	0,184	1,02346		1,02654		1,02739		0,17979		0,17925		0,17911	
0,0124	0,1032	0,48854	0,501	1,06303		1,07226		1,07482		0,47125		0,46720		0,46609	
0,0124	0,2709	0,76952	0,782	1,09252		1,10790		1,11215		0,71573		0,70579		0,70309	

0,0124	0,4988	1,01226	1,025	1,11128	1,13281	1,13877	0,92208	0,90455	0,89982
0,0028	0,1492	0,25757	0,260	1,11702	1,14232	0,91421	0,23309	0,22793	0,28480
0,0127	0,5664	0,95806	0,971	1,11745	1,14329	1,15043	0,86873	0,84911	0,84383
0,0164	0,9402	1,38114	1,398	1,11760	1,14735	1,15558	1,25050	1,21808	1,20940
0,0014	0,0901	0,12325	0,125	1,11519	1,14713	1,15596	0,11178	0,10866	0,10783
0,0176	1,2146	1,31866	1,336	1,08684	1,12709	1,13822	1,22948	1,18558	1,17397
0,0192	1,4412	1,3649	1,384	1,04307	1,08921	1,10198	1,32697	1,27076	1,25604
0,0046	0,3417	0,29901	0,304	0,99974	1,04968	1,06350	0,30365	0,28920	0,28544
0,0049	0,3046	0,28932	0,295	1,02760	1,08488	1,10073	0,28674	0,27160	0,26769
0,0124	0,9122	0,93578	0,936	1,07306	1,07642	1,14076	0,87207	0,86935	0,82031
0,0067	0,5219	0,57868	0,579	1,06201	1,15193	1,16551	0,54489	0,50236	0,49650
0,0053	0,3564	0,19929	0,199	0,66945	0,71450	0,72697	0,29770	0,27892	0,27414
	7,7234						9,61444	9,32834	9,26807

Tabel 5.37 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 45^0 dengan jumlah pias 10

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	7	5
E	0	0
F	7,499	3,6
G	6,873	2,5

L OC = R	6,000
L BC	5,916
L CD	0,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	5,741
F	1,040

Tabel 5.38 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 45^0 dengan jumlah pias 12

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	7	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	0,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	1,200
F1	1,171
F2	1,162
F3	1,160

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,4930	1,0563	1,487	1,435	0,2465	2,3546	5,9949	0,2414	0	0	0,2414	0,1708
2	0,4930	1,0563	1,487	1,435	0,7395	7,0797	5,9543	0,6938	0	0	0,6938	0,4908
3	0,4930	1,0563	1,487	1,435	1,2325	11,8539	5,8720	1,1045	0	0	1,1045	0,7814
4	0,4930	1,0563	1,487	1,435	1,7255	16,7133	5,7465	1,4720	0	0	1,4720	1,0414
5	0,4930	1,0563	1,487	1,435	2,2185	21,7002	5,5748	1,7933	0	0	1,7933	1,2687
6a	0,035	1,0563	1,487	1,435	2,4825	24,4406	5,4623	1,9448	0	0	1,9448	0,0977
W TOTAL LAPISAN III												
6b	0,4580	1,0563	1,487	1,435	2,7290	27,0542	5,3435	2,0725	0	0,229	1,8435	1,3675
7	0,493	1,0563	1,487	1,435	3,2045	32,2818	5,0726	2,2771	0	0,705	1,5726	1,6290
8a	0,149	1,0563	1,487	1,435	3,5255	35,9857	4,8550	2,3805	0	1,026	1,3550	0,5169
W TOTAL LAPISAN II+III												
8b	0,3440	1,0563	1,487	1,435	3,7720	38,9518	4,6660	2,4380	0,1720	1,1	1,1660	1,2008

9	0,4930	1,0563	1,487	1,435	4,1905	44,3001	4,2941	2,4846	0,5905	1,1	0,7941	1,6757
10a	0,4360	1,0563	1,487	1,435	4,6550	50,8806	3,7856	2,4406	1,0550	1,1	0,2856	1,3777
W TOTAL LAPISAN I+II+III												
10b	0,0570	1,0563	1,487	1,435	4,9015	54,7773	3,4605	2,3620	1,3015	1,061	0	0,1683
11a	0,0070	1,0563	1,487	1,435	4,9335	55,3107	3,4148	2,3483	1,3335	1,015	0	0,0204
11b	0,4860	1,0563	1,487	1,435	5,1800	59,6929	3,0278	2,0278	1,4	0,628	0	1,1724
12a	0,0760	1,0563	1,487	1,435	5,4610	65,5284	2,4855	1,4855	1,4	0,085	0	0,1220
W TOTAL LAPISAN I+II												
12b	0,4170	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,851	0	0	0,3746
W TOTAL LAPISAN I												

Tabel 5.38 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 45^0 dengan jumlah pias 12 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	1,200	F1	1,171	F2	1,162	F0	1,200	F1	1,171	F2	1,162
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0104	0,0070	0,11966	0,130	1,02315		1,02374		1,02392		0,12707		0,12700		0,12698	
0,0104	0,0605	0,34384	0,354	1,06435		1,06613		1,06668		0,33278		0,33222		0,33205	
0,0104	0,1606	0,54744	0,558	1,09863		1,10159		1,10251		0,50772		0,50635		0,50593	
0,0104	0,2996	0,72958	0,740	1,12568		1,12983		1,13111		0,65732		0,65490		0,65416	
0,0104	0,4693	0,8888	0,899	1,14502		1,15035		1,15200		0,78527		0,78163		0,78051	
0,0007	0,0404	0,06843	0,069	1,15196		1,15196		1,15977		0,06004		0,06004		0,05964	
0,0127	0,6222	0,95806	0,971	1,15613		1,16268		1,16471		0,83967		0,83494		0,83349	
0,0137	0,8703	1,14124	1,155	1,15723		1,16493		1,16731		0,99800		0,99141		0,98939	
0,0041	0,3038	0,36215	0,366	1,15217		1,16064		1,16326		0,31790		0,31559		0,31487	
0,0112	0,7552	0,84124	0,852	1,14465		1,15371		1,15651		0,74470		0,73885		0,73706	
0,0160	1,1707	1,17397	1,190	1,12335		1,13341		1,13653		1,05933		1,04992		1,04705	

4	0,4930	1,0563	1,487	1,435	1,7255	16,7133	5,7465	1,4720	0	0	1,4720	1,0414	0,2996	0,9974
5	0,4930	1,0563	1,487	1,435	2,2185	21,7002	5,5748	1,7933	0	0	1,7933	1,2687	0,4693	1,1787
6a	0,035	1,0563	1,487	1,435	2,4825	24,4406	5,4623	1,9448	0	0	1,9448	0,0977	0,0404	0,0889
W TOTAL LAPISAN III														3,6874
6b	0,4580	1,0563	1,487	1,435	2,7290	27,0542	5,3435	2,0725	0	0,229	1,8435	1,3675	0,6222	1,2178
7	0,493	1,0563	1,487	1,435	3,2045	32,2818	5,0726	2,2771	0	0,705	1,5726	1,6290	0,8703	1,3770
8a	0,149	1,0563	1,487	1,435	3,5255	35,9857	4,8550	2,3805	1	1,026	0,3550	0,4605	0,2707	0,3726
W TOTAL LAPISAN II+III														2,9673
8b	0,3440	1,0563	1,487	1,435	3,7720	38,9518	4,6660	2,4380	0,1720	1,1	1,1660	1,2008	0,7552	0,9336
9	0,4930	1,0563	1,487	1,435	4,1905	44,3001	4,2941	2,4846	0,5905	1,1	0,7941	1,6757	1,1707	1,1989
10a	0,4360	1,0563	1,487	1,435	4,6550	50,8806	3,7856	2,4406	1,0550	1,1	0,2856	1,3777	1,0692	0,8689
W TOTAL LAPISAN I+II+III														3,0014
10b	0,0570	1,0563	1,487	1,435	4,9015	54,7773	3,4605	2,3620	1,3015	1,061	0	0,1683	0,1375	0,0970
11a	0,0070	1,0563	1,487	1,435	4,8765	54,3655	3,4957	2,3722	1,3335	1,039	0	0,0207	0,0168	0,0120
11b	0,4860	1,0563	1,487	1,435	5,1800	59,6929	3,0278	2,0278	1,4	0,628	0	1,1724	1,0124	0,5912
12a	0,0760	1,0563	1,487	1,435	5,4610	65,5284	2,4855	1,4855	1,4	0,085	0	0,1220	0,1111	0,0505
W TOTAL LAPISAN I+II														0,7507
12b	0,4170	1,0563	1,487	1,435	5,7075	72,0359	1,8505	0,8505	0,851	0	0	0,3746	0,3564	0,1154
W TOTAL LAPISAN I													7,4300	0,1154

Tabel 5.40 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 45^0 dengan jumlah pias 14

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	7	5
E	0	0

L OC = R	6,000
L BC	5,916
L CD	0,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000

φ1	28,000
φ2	38,000
φ3	35,000
c1	0,042
c2	0,035
c3	0,021
F0	2,200

0,0162	0,7967	0,70723	0,723	0,78673	0,96611	1,02313	0,91950	0,74877	0,70704
0,0002	0,0071	0,00605	0,006	0,72617	0,91281	0,97214	0,00860	0,00684	0,00643
0,0175	0,3565	0,19934	0,217	0,53790	0,66978	0,71171	0,40318	0,32379	0,30472
	7,4570						10,42753	9,34510	9,05590

Tabel 5.41 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 45^0 dengan jumlah pias 14

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	7	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

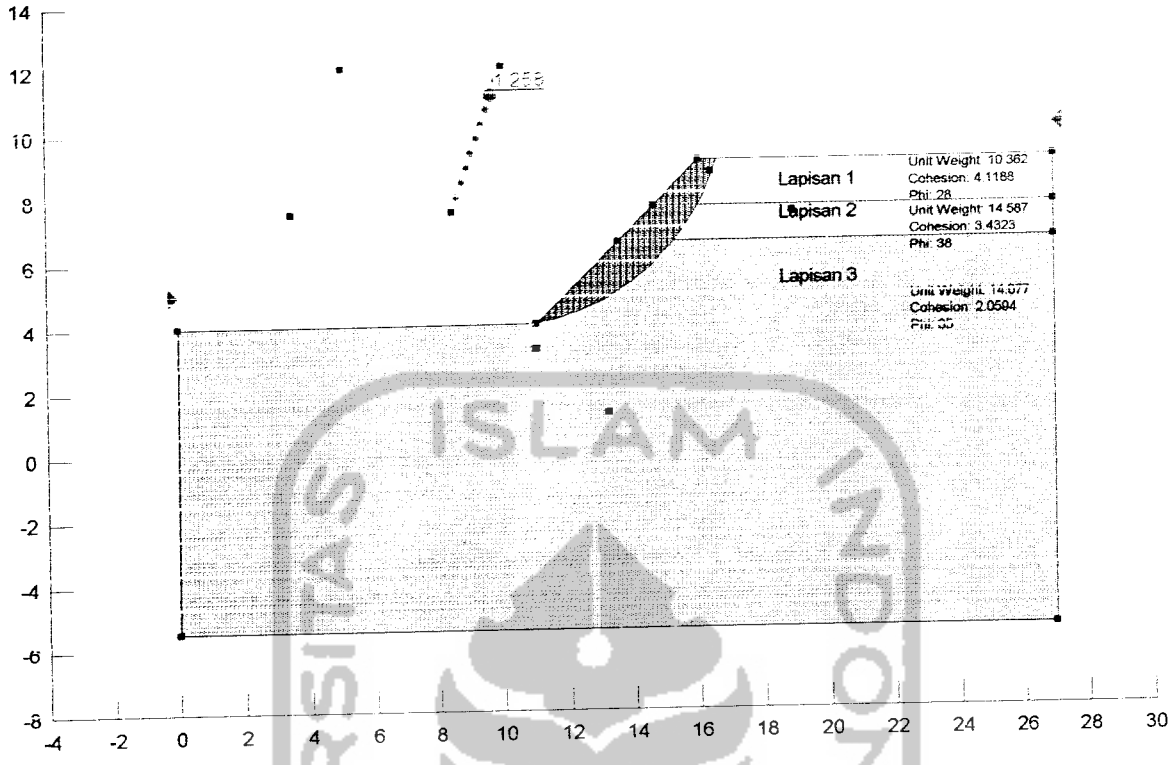
L OC = R	6,000
L BC	5,916
L CD	0,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

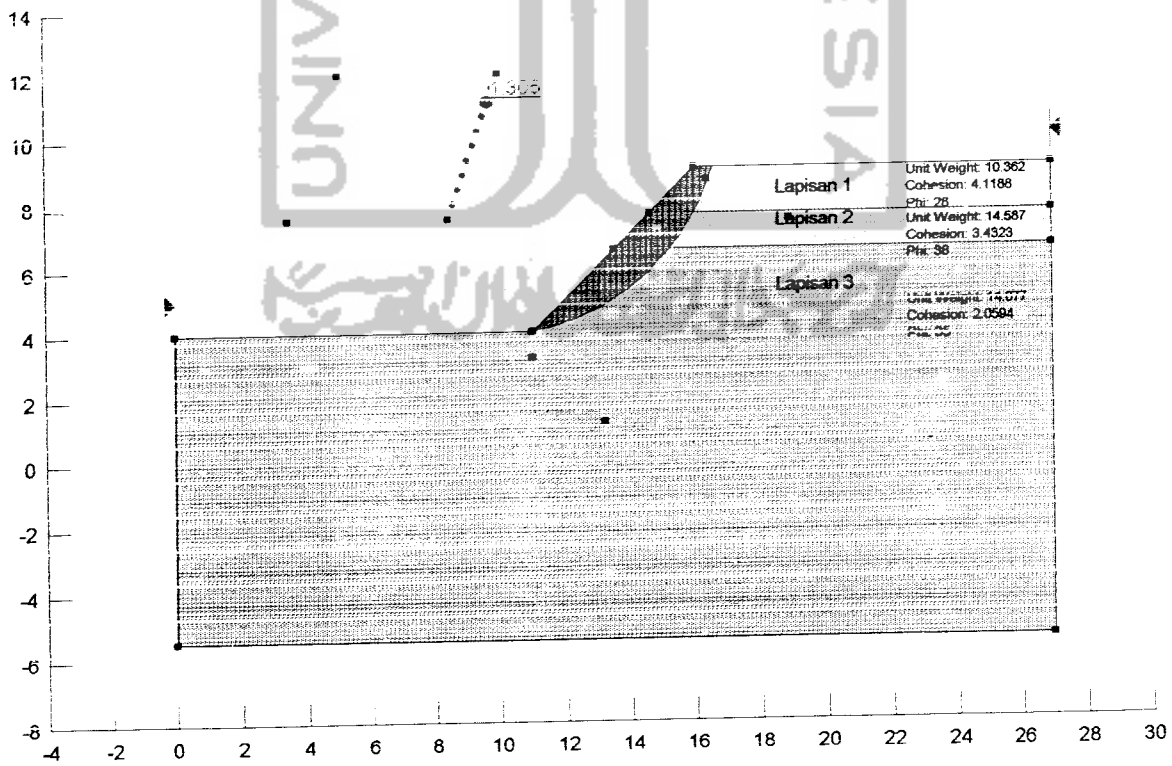
c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
ΣW cos α x tgn φ	7,435
F	1,027

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,4226	1,0563	1,487	1,435	0,2113	2,0182	5,9963	0,2076	0	0	0,2076	0,1259	0,0044	0,1258
2	0,4226	1,0563	1,487	1,435	0,6339	6,0646	5,9664	0,6003	0	0	0,6003	0,3641	0,0385	0,3620
3	0,4226	1,0563	1,487	1,435	1,0565	10,1417	5,9063	0,9628	0	0	0,9628	0,5838	0,1028	0,5747
4	0,4226	1,0563	1,487	1,435	1,4791	14,2715	5,8148	1,2939	0	0	1,2939	0,7847	0,1935	0,7604
5	0,4226	1,0563	1,487	1,435	1,9017	18,4786	5,6907	1,5924	0	0	1,5924	0,9657	0,3062	0,9158
6a	0,3870	1,0563	1,487	1,435	2,3065	22,6075	5,5390	1,8455	0	0	1,8455	1,0249	0,3941	0,9461
W TOTAL LAPISAN III														3,6849

6b	0,0356	1,0563	1,487	1,435	2,5178	24,8114	5,4462	1,9640	0	0,018	1,9462	0,1004	0,0421	0,0911
7	0,4226	1,0563	1,487	1,435	2,7469	27,2463	5,3343	2,0812	0	0,247	1,8343	1,2675	0,5805	1,1268
8	0,4226	1,0563	1,487	1,435	3,1695	31,8873	5,0945	2,2640	0	0,670	1,5945	1,3877	0,7333	1,1781
9a	0,2192	1,0563	1,487	1,435	3,4904	35,5725	4,8803	2,3707	0	0,990	1,3803	0,7570	0,4405	0,6156
W TOTAL LAPISAN II+III														3,0116
9b	0,2034	1,0563	1,487	1,435	3,7017	38,0957	4,7220	2,4237	0,102	1,1	1,2220	0,7112	0,4389	0,5596
10	0,4226	1,0563	1,487	1,435	4,0147	41,9989	4,4589	2,4736	0,415	1,1	0,9589	1,4579	0,9758	1,0832
11	0,4226	1,0563	1,487	1,435	4,4373	47,6931	4,0386	2,4759	0,837	1,1	0,5386	1,3916	1,0295	0,9364
12a	0,2244	1,0563	1,478	1,435	4,7608	52,5107	3,6517	2,4125	1,161	1,1	0,1517	0,6888	0,5467	0,4190
W TOTAL LAPISAN I+II+III														2,9982
12b	0,1270	1,0563	1,487	1,435	4,9365	55,3610	3,4104	2,3469	1,337	1,010	0	0,3701	0,3046	0,2103
12c	0,0712	1,0563	1,487	1,435	5,0356	57,0628	3,2623	2,2623	1,4	0,862	0	0,1966	0,1650	0,1068
13	0,4226	1,0563	1,487	1,435	5,2825	61,6927	2,8452	1,8452	1,4	0,445	0	0,9047	0,7967	0,4287
14a	0,0052	1,0563	1,487	1,435	5,4964	66,3577	2,4062	1,4062	1,4	0,006	0	0,0077	0,0071	0,0031
W TOTAL LAPISAN I+II														0,7488
14b	0,4174	1,0563	1,487	1,435	5,7077	72,0421	1,8499	0,8499	0,8499	0	0	0,3747	0,3565	0,1154
W TOTAL LAPISAN I													7,4570	0,1154



Gambar 5.7 Tampilan *Output* untuk Metode Fellinius Sudut Kemiringan 45^0



Gambar 5.8 Tampilan *Output* untuk Metode Bishop Sudut Kemiringan 45^0

0,0142	1,0692	0,96521	0,979	1,08373	1,09492	1,09837	0,90371	0,89448	0,89167
0,0022	0,1375	0,13153	0,134	1,10875	1,12189	1,12595	0,12059	0,11918	0,11875
0,0003	0,0168	0,01596	0,016	1,10459	1,11781	1,12190	0,01470	0,01452	0,01447
0,0186	1,0124	0,91649	0,935	1,06681	1,08070	1,08499	0,87652	0,86526	0,86183
0,0029	0,1111	0,09541	0,098	1,00686	1,02149	1,02602	0,09764	0,09624	0,09582
0,0175	0,3564	0,19929	0,217	0,72970	0,74011	0,74333	0,29712	0,29294	0,29167
	7,4632						8,74009	8,67548	8,65534

Tabel 5.39 Perhitungan Stabilitas Lereng Metode Fellinius Untuk Sudut Kemiringan 45^0 dengan jumlah pias 12

titik	koordinat	
	X	Y
A	2	0
B	2	5
C	7,916	5
D	7	5
E	0	0
F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

L OC = R	6,000
L BC	5,916
L CD	0,916
L OB	1,000
L OA = R	6,000
L OE	6,000
L EA	2,000
Sudut COB	80,406
Sudut AOC	80,406

Sudut COF	13,984
Sudut FOG	12,107
Sudut GOA	54,315
L CF	1,464
L FG	1,268
L GA	5,688
φ1	28,000
φ2	38,000
φ3	35,000

c1	0,042
c2	0,035
c3	0,021
LACxc	0,225
W cos α x tgn θ	7,409
F	1,027

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W	W sin θ	W cos θ
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)	(t/m)	(t/m)
1	0,4930	1,0563	1,487	1,435	0,2465	2,3546	5,9949	0,2414	0	0	0,2414	0,1708	0,0070	0,1707
2	0,4930	1,0563	1,487	1,435	0,7395	7,0797	5,9543	0,6938	0	0	0,6938	0,4908	0,0605	0,4871
3	0,4930	1,0563	1,487	1,435	1,2325	11,8539	5,8720	1,1045	0	0	1,1045	0,7814	0,1606	0,7647

F	7,499	3,6
G	6,873	2,5
H	7,916	6
O	2	6

Sudut COB	80,406
Sudut AOC	80,406

F1	1,398
F2	1,253
F3	1,214

pias ke	B	γ1	γ2	γ3	xi	θ	yi	h	h lap. 1	h lap. 2	h lap. 3	W
	(m)	(t/m3)	(t/m3)	(t/m3)	(m)	(°)	(m)	(m)	(m)	(m)	(m)	(t/m)
	1	2	3	4	5	6	7	8	9	10	11	12
1	0,4226	1,0563	1,487	1,435	0,2113	2,0182	5,9963	0,2076	0	0	0,2076	0,1259
2	0,4226	1,0563	1,487	1,435	0,6339	6,0646	5,9664	0,6003	0	0	0,6003	0,3641
3	0,4226	1,0563	1,487	1,435	1,0565	10,1417	5,9063	0,9628	0	0	0,9628	0,5838
4	0,4226	1,0563	1,487	1,435	1,4791	14,2715	5,8148	1,2939	0	0	1,2939	0,7847
5	0,4226	1,0563	1,487	1,435	1,9017	18,4786	5,6907	1,5924	0	0	1,5924	0,9657
6a	0,3870	1,0563	1,487	1,435	2,3065	22,6075	5,5390	1,8455	0	0	1,8455	1,0249
W TOTAL LAPISAN III												
6b	0,0356	1,0563	1,487	1,435	2,5178	24,8114	5,4462	1,9640	0	0,018	1,9462	0,1004
7	0,4226	1,0563	1,487	1,435	2,7469	27,2463	5,3343	2,0812	0	0,247	1,8343	1,2675
8	0,4226	1,0563	1,487	1,435	3,1695	31,8873	5,0945	2,2640	0	0,670	1,5945	1,3877
9a	0,2192	1,0563	1,487	1,435	3,4904	35,5725	4,8803	2,3707	0	0,990	1,3803	0,7570
W TOTAL LAPISAN II+III												
9b	0,2034	1,0563	1,487	1,435	3,7017	38,0937	4,7220	2,4237	0,102	1,1	1,2220	0,7112
10	0,4226	1,0563	1,487	1,435	4,0147	41,9989	4,4589	2,4736	0,415	1,1	0,9589	1,4579
11	0,4226	1,0563	1,487	1,435	4,4373	47,6931	4,0386	2,4759	0,837	1,1	0,5386	1,3916
12a	0,2244	1,0563	1,478	1,435	4,7608	52,5107	3,6517	2,4125	1,161	1,1	0,1517	0,6888
W TOTAL LAPISAN I+II+III												
12b	0,1270	1,0563	1,487	1,435	4,9365	55,3610	3,4104	2,3469	1,337	1,010	0	0,3701
12c	0,0712	1,0563	1,487	1,435	5,0356	57,0628	3,2623	2,2623	1,4	0,862	0	0,1966
13	0,4226	1,0563	1,487	1,435	5,2825	61,6927	2,8452	1,8452	1,4	0,445	0	0,9047

14a	0,0052	1,0563	1,487	1,435	5,4964	66,3577	2,4062	1,4062	1,4	0,006	0	0,0077
W TOTAL LAPISAN I+II												
14b	0,4174	1,0563	1,487	1,435	5,7077	72,0421	1,8499	0,8499	0,850	0	0	0,3747
W TOTAL LAPISAN I												

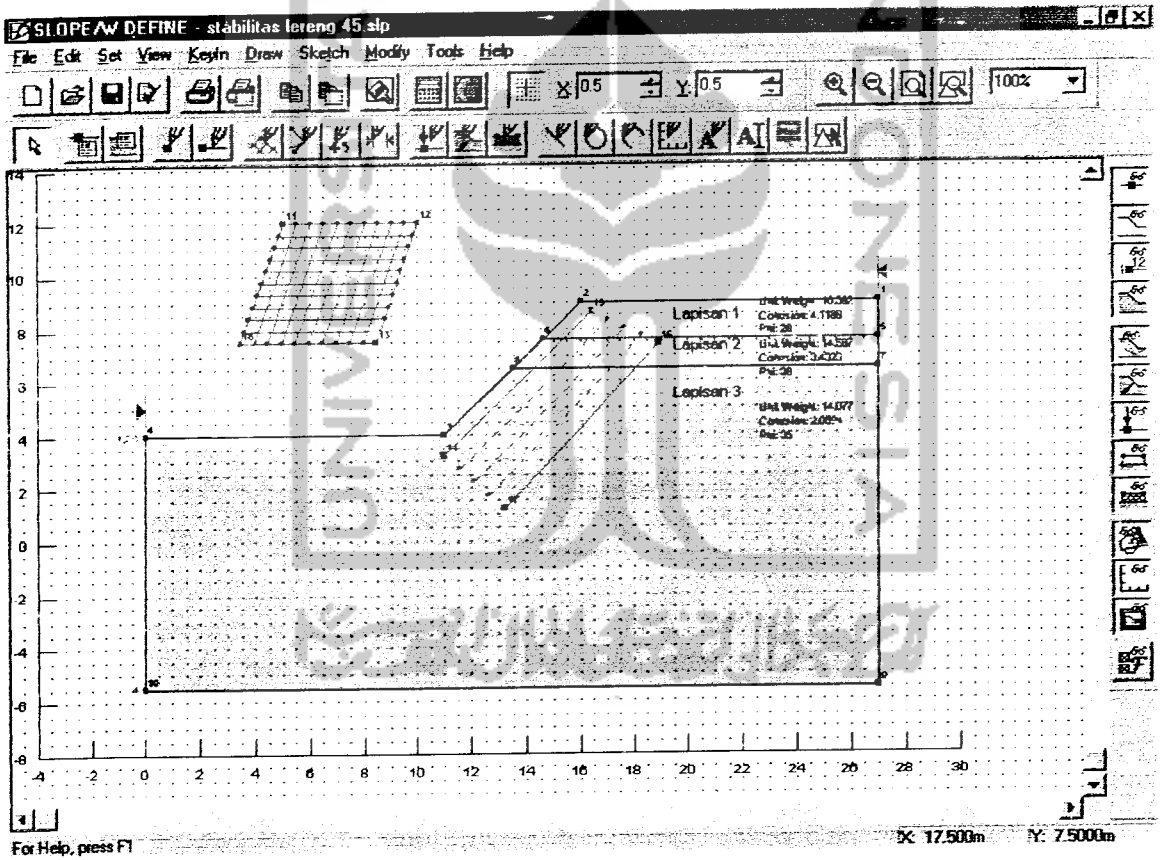
Tabel 5.40 Perhitungan Stabilitas Lereng Metode Bishop Untuk Sudut Kemiringan 45^0 dengan jumlah pias 14 (lanjutan)

cxB	**W sin θ**	**W tg φ**	**13+15**	**Mi** (t/m)						**16/17** (t/m)					
(t/m)	(t/m)	(t/m)	(t/m)	F0	2,200	F1	1,398	F2	1,253	F0	2,200	F1	1,398	F2	1,253
13	14	15	16	17a		17b		17c		18a		18b		18c	
0,0089	0,0044	0,08819	0,097	1,01060		1,01703		1,01907		0,09605		0,09544		0,09525	
0,0089	0,0385	0,25505	0,264	1,02806		1,04735		1,05348		0,25672		0,25199		0,25052	
0,0089	0,1028	0,40902	0,418	1,04046		1,07262		1,08284		0,40165		0,38961		0,38593	
0,0089	0,1935	0,54973	0,559	1,04765		1,09267		1,10698		0,53320		0,51123		0,50462	
0,0089	0,3062	0,67651	0,685	1,04937		1,10725		1,12565		0,65314		0,61900		0,60888	
0,0081	0,3941	0,71799	0,726	1,04556		1,11576		1,13808		0,69448		0,65078		0,63802	
0,0010	0,0421	0,07031	0,071	1,04130		1,11794		1,14230		0,06847		0,06378		0,06242	
0,0117	0,5805	0,88799	0,900	1,03480		1,11841		1,14499		0,86946		0,80446		0,78579	
0,0117	0,7333	0,97218	0,984	1,01725		1,11372		1,14438		0,96723		0,88344		0,85977	
0,2434	0,4405	0,53033	0,774	0,99855		1,10478		1,13855		0,77487		0,70036		0,67959	
0,0066	0,4389	0,49827	0,505	0,98337		1,09603		1,13185		0,51342		0,46064		0,44607	
0,0137	0,9758	1,02137	1,035	0,95611		1,07830		1,11714		1,08262		0,95994		0,92657	
0,0137	1,0295	0,97495	0,989	0,90843		1,04348		1,08641		1,08834		0,94749		0,91005	
0,0073	0,5467	0,48257	0,490	0,86107		1,00596		1,05202		0,56890		0,48696		0,46564	
0,0049	0,3046	0,28932	0,294	0,86051		1,02814		1,08143		0,34187		0,28612		0,27203	
0,0027	0,1650	0,15368	0,156	0,84167		1,01268		1,06703		0,18582		0,15444		0,14658	

5.6 Analisis Stabilitas Lereng dengan *Slope*/W

Perhitungan dilakukan dengan memasukkan data terlebih dahulu (*Slope*/W *define*), kemudian dilakukan ekesekusi hitungan (*Slope*/W *Solve*) untuk mendapatkan nilai *F* nya, selanjutnya didapatkan *output* gambar. Untuk sudut kemiringan 90^0 tidak bisa dianalisis dengan menggunakan program *Slope*/W karena terjadi vertikal segmen.

5.6.1 Perhitungan sudut kemiringan 45^0



Gambar 5.6 Tampilan *Input* Data Sudut Kemiringan 45^0

Kordinat titk O untuk metode Fellinius = metode Bishop:

X-Coordinate = 9.685

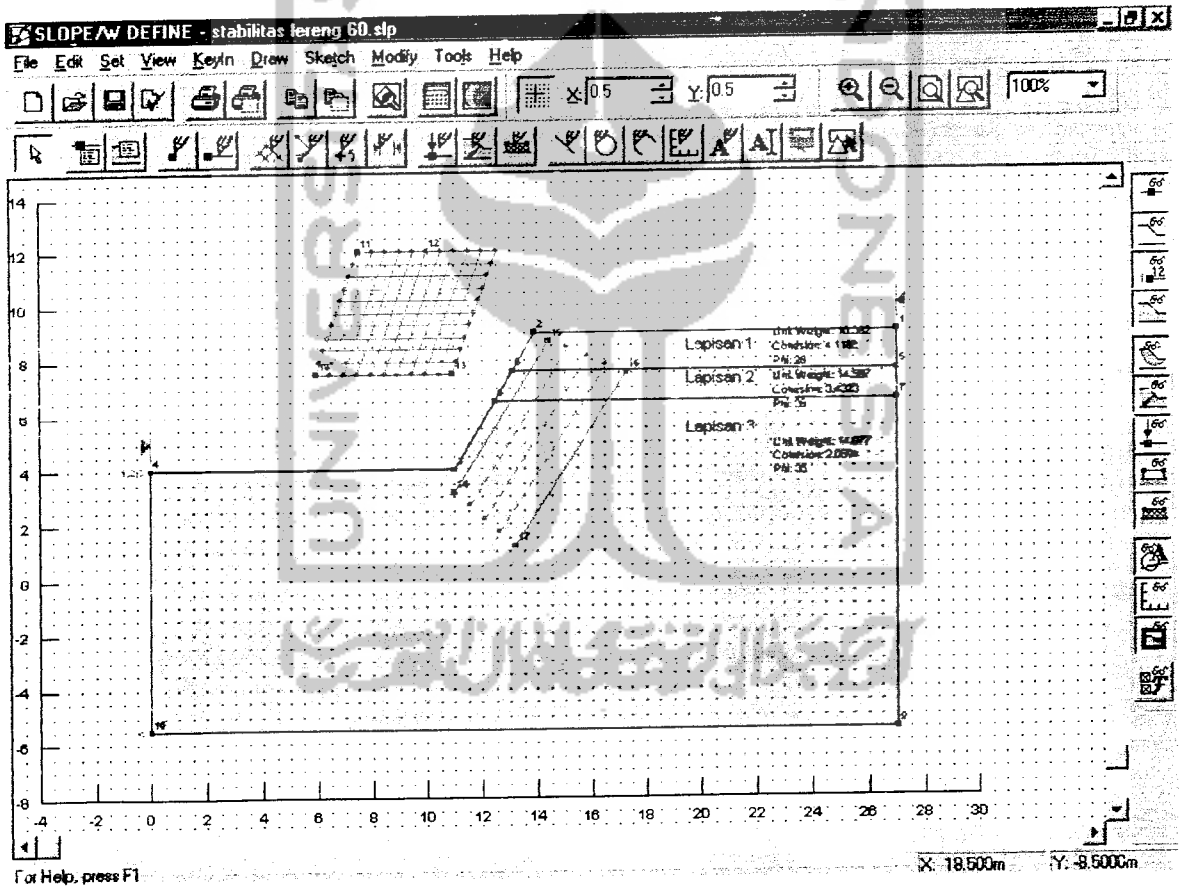
Y-Coordinate = 11.095

Nilai SF:

SF Fellinius = 1,258

SF Bishop = 1,305

5.6.2 Perhitungan sudut kemiringan 60^0



Gambar 5.9 Tampilan *Input* Data Sudut Kemiringan 60^0

Kordinat titk O untuk metode Fellinius = metode Bishop:

X-Coordinate = 9.0675

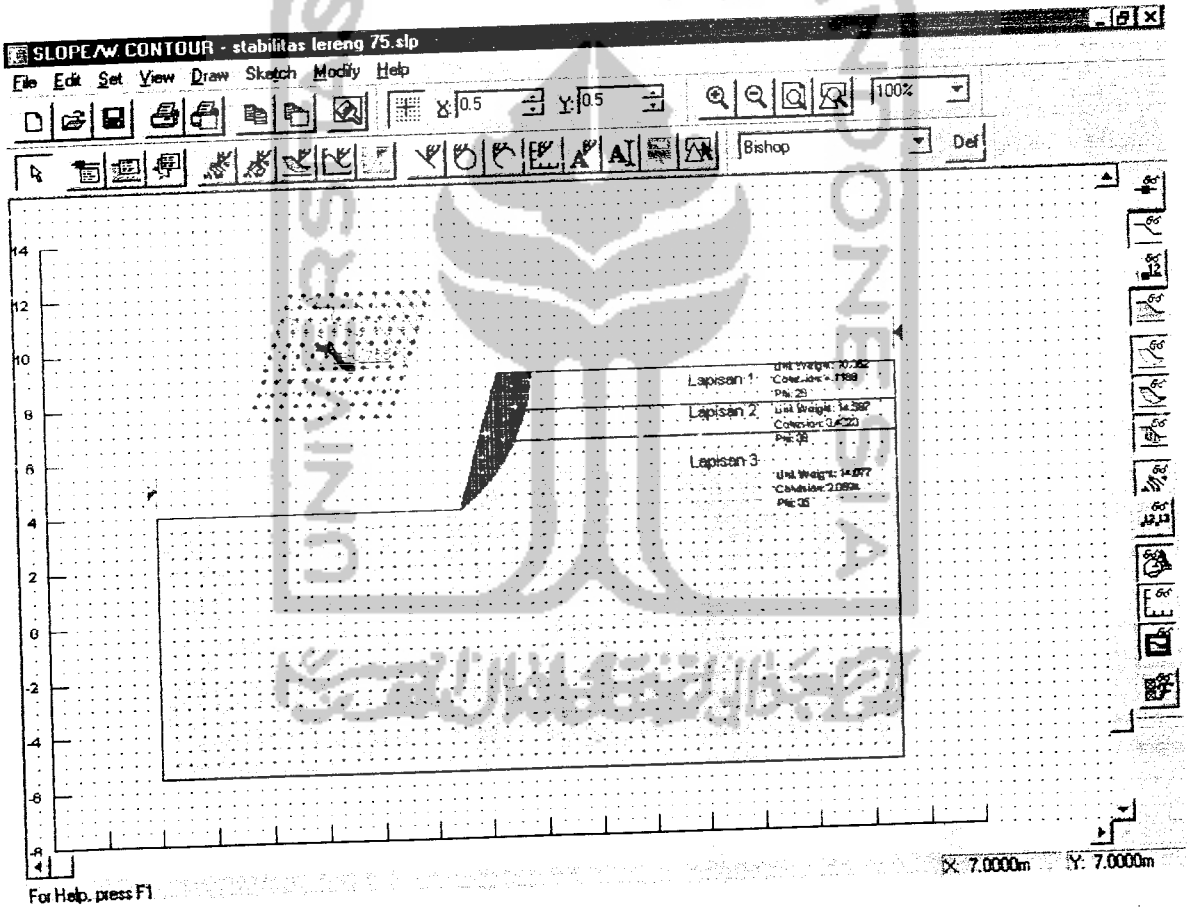
Y-Coordinate = 9.3

Nilai SF:

SF Fellinius = 0,974

SF Bishop = 0.988

5.6.3 Perhitungan sudut kemiringan 75^0



Gambar 5.12 Tampilan *Input* Data Sudut Kemiringan 75^0