Day : 2

PLAXIS 2D TUTORIAL



Ali Imron

Faculty of Engineering – Civil Departement
Diponegoro University
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Content

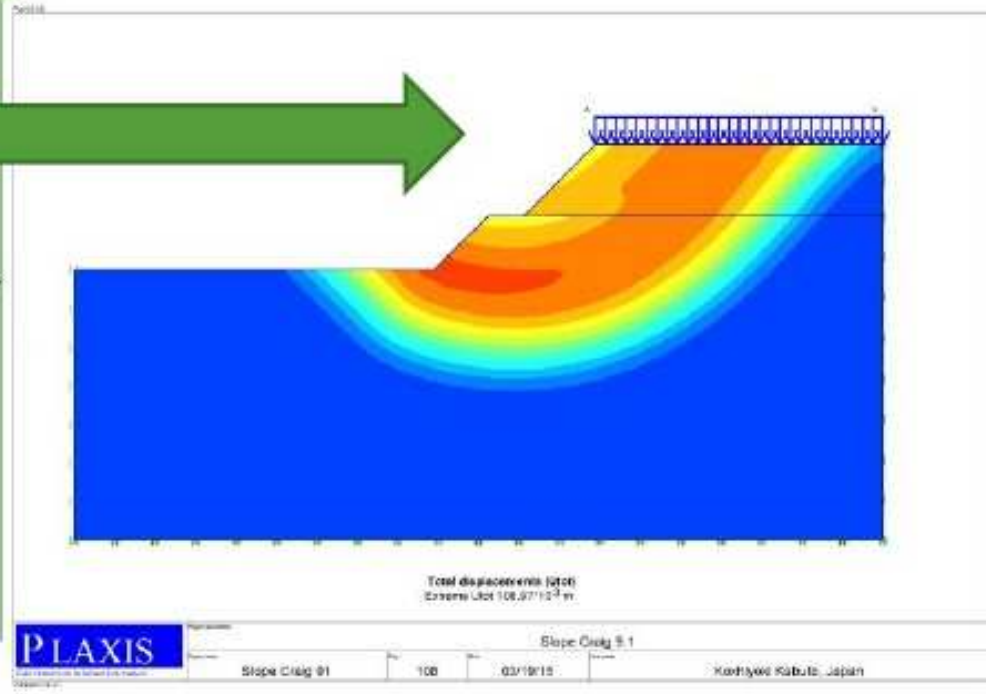
- Day 1 : Kresno Wikan Sadono, ST,M.Eng
  General Knoledge
- Day 2 : Ali Imron
  Parameter Reading, Slope Stability,
- Day 3 : Ali Imron
  dam and Footing
- Day 4 : ali & lala
  Footing and Sheet Pile,
- Day 5 : Lala Fitriantina
  Deep Excavation
- Day 6 : Examine

CASE 1, Are U Ready?

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CHAPTER 1 : SLOPE STABILITY

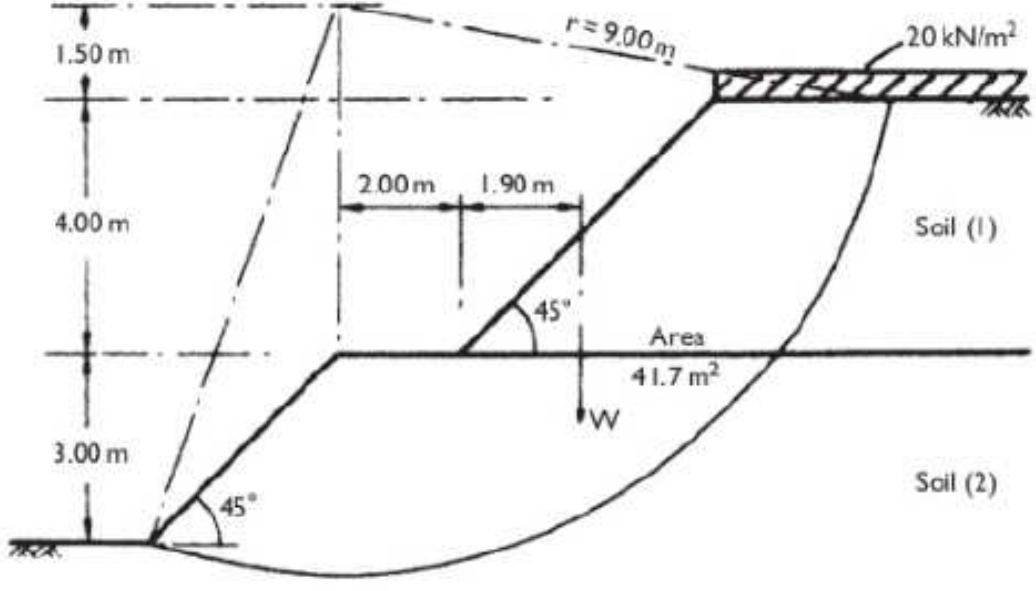




CASE

Suatu lereng dengan geometri seperti gambar di bawah ini. Kedua lapisan tanah memiliki berat jenis yang sama, 19 kN/m^3, dengan nilai parameter geser undained Cu(1) 30 kN/m^2 dan 45 kN/m^2. Hitunglah menggunakan permodelan Plaxis untuk mengetahui besarnya nilai SF.





Gambar 1.1 Geometri Lereng

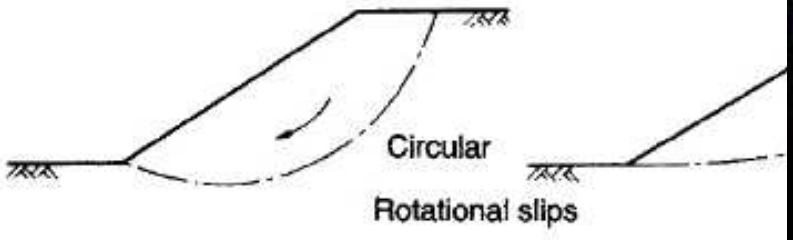
Material Input

Tabel 1.2 Paramater Tanah

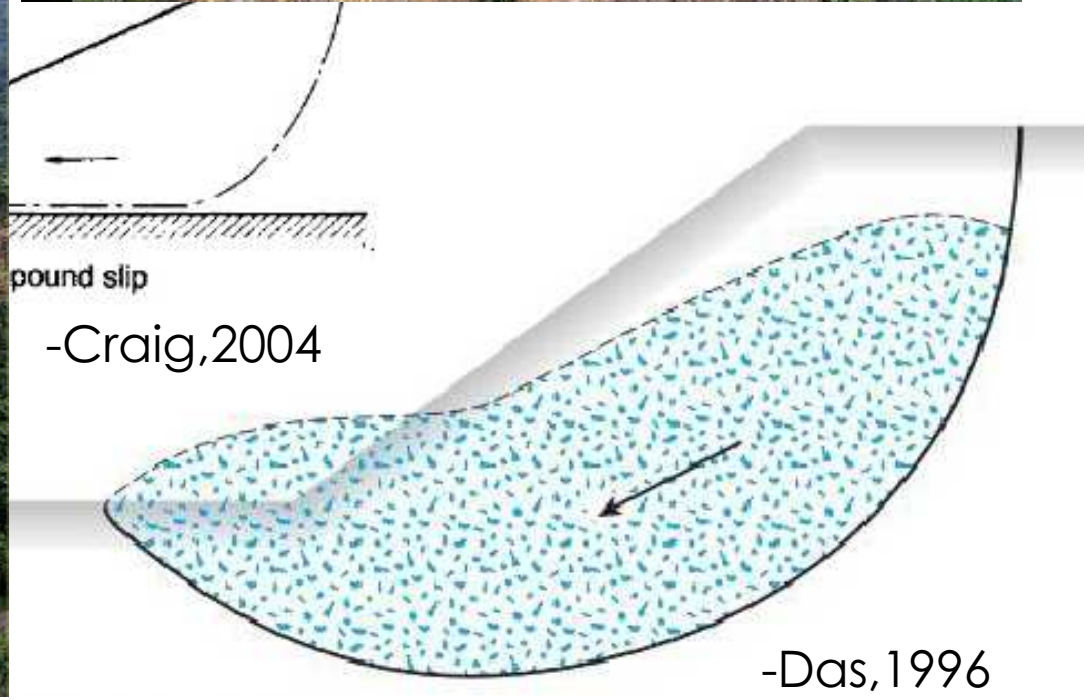
Parameters	Name	Layer 1	Layer 2	Units
Model	*Model*	MC	MC	-
Type of Behavior	*Type*	Undrained	Undrained	-
Soil Weight Unsaturated	γ_{unsat}	19	19	kN/m^3
Soil Weight Saturated	γ_{sat}	20	20	kN/m^3
Young's Modulus	E_{ref}	30000	30000	kN/m^2
Poisson Ratio	v	0.35	0.35	-
Cohesion	C_{ref}	30	45	kN/m^2
Friction Angle	ϕ	1.0	1.0	°

Type Of Failure in









-Craig,2004

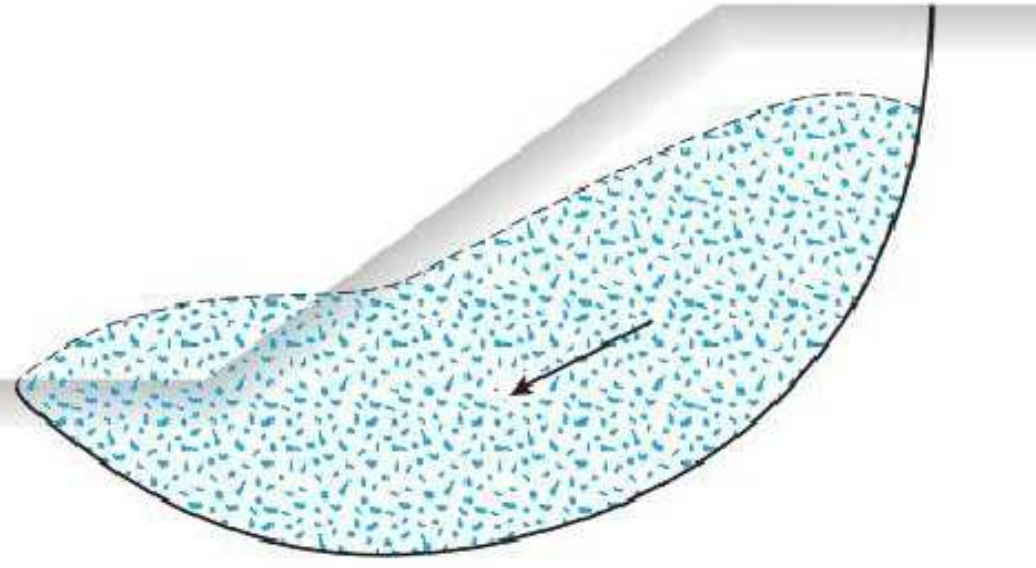
-Das,1996

civilengineeringtr



♥ 1.585 suka

civilengineeringtr Japan earthquake ,landslide rips a Japanese mountain



re 15.4 Slope failure by "sliding"

Other features can be read beside Fos.....

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Some Comments

- A tiny model or layer will make an error "mash generation" command.
- Memorize the "parameter input" in every type of calculation :
  - Stage of Construction
  - P/C reduction
  - Initial stress
- Use some features, beside FoS, to do the validation on your calculation

Some Comments

- It is better to enlarge the boundary area that u want to envolve inside calculation, so the Fos is more accurate when compared by manual calculation
- May this can be a guidance to make an ideal Boundary area where:
  - Depth = 1-0,5 Height
  - Wide = 1-0,5 Height
- The simplify of model geometry is verry important factor of modelling, => Take a Critical Geometry

PARAMETER READING

Unit Weight For Soil

Table 7.3 Representative range of dry unit weight.

Type	*Soil description*	*Unit weight range (kN/m^3)*	
		Dry	*Saturated*
Cohesionless	Soft sedimentary (chalk, shale, siltstone, coal)	12	18
Compacted Broken rock	Hard sedimentary (Conglomerate, sandstone)	14	19
	Metamorphic	18	20
	Igneous	17	21
Cohesionless Sands and gravels	Very loose	14	17
	Loose	15	18
	Medium dense	17	20
	Dense	19	21
	Very dense	21	22
Cohesionless Sands	Loose		
	Uniformly graded	14	17
	Well graded	16	19
	Dense		
	Uniformly graded	18	20
	Well graded	19	21
Cohesive	Soft – organic	8	14
	Soft – non organic	12	16
	Stiff	16	18
	Hard	18	20

- Use saturated unit weight for soils below the water table a capillary fringe above the water table.
- Buoyant unit weight = Saturated unit weight – unit wei

Effective Friction Angle

Table 7.8 Typical friction angle of granular soils.

Type	*Description/state*	*Friction angle (degrees)*
Cohesionless	Soft sedimentary (chalk, shale, siltstone, coal)	30–40
Compacted	Hard sedimentary (conglomerate, sandstone)	35–45
Broken rock	Metamorphic	35–45
	Igneous	40–50
Cohesionless	Very loose/loose	30–34
Gravels	Medium dense	34–39
	Dense	39–44
	Very dense	44–49
Cohesionless	Very loose/loose	27–32
Sands	Medium dense	32–37
	Dense	37–42
	Very dense	42–47
Cohesionless	Loose	
Sands	Uniformly graded	27–30
	Well graded	30–32
	Dense	
	Uniformly graded	37–40
	Well graded	40–42

Effective Cohession

7.9 Effective strength of cohesive soils

- The typical peak strength is shown in the table.
- Allowance should be made for long term softening of the clay, with loss of effective cohesion.
- Remoulded strength and residual strength values would have a reduction in both cohesion and friction.

Table 7.9 Effective strength of cohesive soils

Type	*Soil description/state*	*Effective cohesion (kPa)*	*Friction angle (degrees)*
Cohesive	Soft – organic	5–10	10–20
	Soft – non organic	10–20	15–25
	Stiff	20–50	20–30
	Hard	50–100	25–30

- Friction may increase with sand and stone content, and for lower plasticity clays.
- When the percentage coarse exceeds 30%, then some frictional strength is present.



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PERMEABILITY

Table 8.4 Permeability based on soils classification.

Soil type	*Description*	*USC symbol*	*Permeability, m/s*
Gravels	Well graded	GW	10^{-3} to 10^{-1}
	Poorly graded	GP	10^{-2} to 10
	Silty	GM	10^{-7} to 10^{-5}
	Clayey	GC	10^{-8} to 10^{-6}
Sands	Well graded	SW	10^{-5} to 10^{-3}
	Poorly graded	SP	10^{-4} to 10^{-2}
	Silty	SM	10^{-7} to 10^{-5}
	Clayey	SC	10^{-8} to 10^{-6}
Inorganic silts	Low plasticity	ML	10^{-9} to 10^{-7}
	High plasticity	MH	10^{-9} to 10^{-7}
Inorganic clays	Low plasticity	CL	10^{-9} to 10^{-7}
	High plasticity	CH	10^{-10} to 10^{-8}
Organic	with silts/clays of low plasticity	OL	10^{-8} to 10^{-6}
	with silts/clays of high plasticity	OH	10^{-7} to 10^{-5}
Peat	Highly organic soils	Pt	10^{-6} to 10^{-4}

- Does not account for structure or stratification.



ELASTISITY MODULUS

Table 11.7 Elastic parameters of various soils.

Type	*Strength of soil*	*Elastic modulus, E (MPa)*	
		Short term	*Long term*
Gravel	Loose	25–50	
	Medium	50–100	
	Dense	100–200	
Medium to coarse sand	Very loose	<5	
	Loose	3–10	
	Medium dense	8–30	
	Dense	25–50	
	Very dense	40–100	
Fine sand	Loose	5–10	
	Medium	10–25	
	Dense	25–50	
Silt	Soft	<10	<8
	Stiff	10–20	8–15
	Hard	>20	>15
Clay	Very soft	<3	<2
	Soft	2–7	1–5
	Firm	5–12	4–8
	Stiff	10–25	7–20
	Very stiff	20–50	15–35
	Hard	40–80	30–60

POISSON RATIO FOR SOIL

Material	*Short term*	*Long term*
Sands, gravels and other cohesionless soils	0.30	0.30
Low PI (< 12%)	0.35	0.25
Medium PI (12% < PI < 22%)	0.40	0.30
High PI (22% < PI < 32%)	0.45	0.35
Extremely high PI (PI > 32%)	0.45	0.40

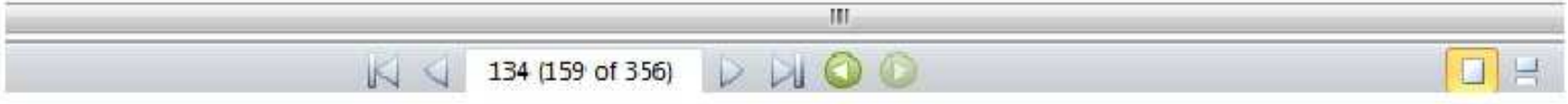
Unit Weight For Rock

Origin	Rock type	Unit weight range (kN/m^3)			
	Weathering	XW	DW	SW	Fr
Sedimentary	Shale	20–22	21–23	22–24	23–25
	Sandstone	18–21	20–23	22–25	24–26
	Limestone	19–21	21–23	23–25	25–27
Metamorphic	Schist	23–25	24–26	25–27	26–28
	Gneiss	23–26	24–27	26–28	27–29
Igneous	Granite	25–27	26–27	27–28	28–29
	Basalt	20–23	23–26	25–28	27–30

POISSON RATIO FOR ROCK

Table 11.23 Poisson's ratio for rock.

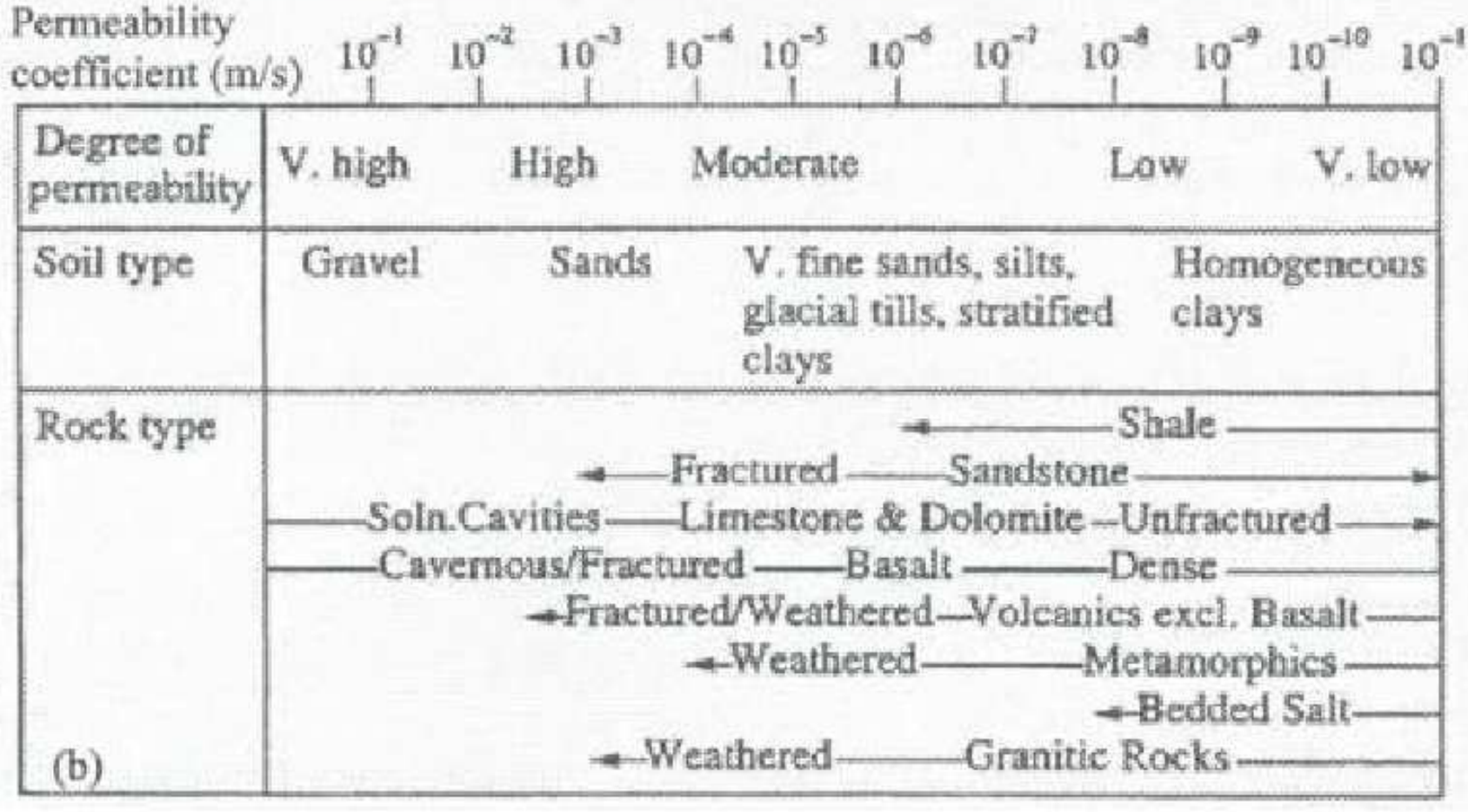
Rock type	*Poisson's ratio*
Basalt	0.1 to 0.2
Granite	0.15 to 0.25
Sandstone	0.15 to 0.3
Limestone	0.25 to 0.35



STRENGTH PARAMETER FOR ROCK

Origin	*Rock type*	*Shear strength*	
		Cohesion (MPa)	*Friction angle°*
Sedimentary – soft	Sandstone (triassic), coal, chalk, shale, limestone (triassic)	1–20	25–35
Sedimentary – hard	Limestone, dolomite, greywacke sandstone (carborniferous), Limestone (carborniferous)	10–30	35–45
Metamorphic – non-foliated	Quartzite, marble, gneiss	20–40	30–40
Metamorphic – foliated	Schist, slate, phyllite	10–30	25–35
Igneous – acid	Granite	30–50	45–55
Igneous – basic	Basalt	30–50	30–40

Permeability For Rock





Example 15.9

For the slope shown in Figure 15.31, find the factor of safety against sliding for the trial slip surface *AC*. Use the ordinary method of slices.

Solution

The sliding wedge is divided into seven slices. Now the following table can be prepared:

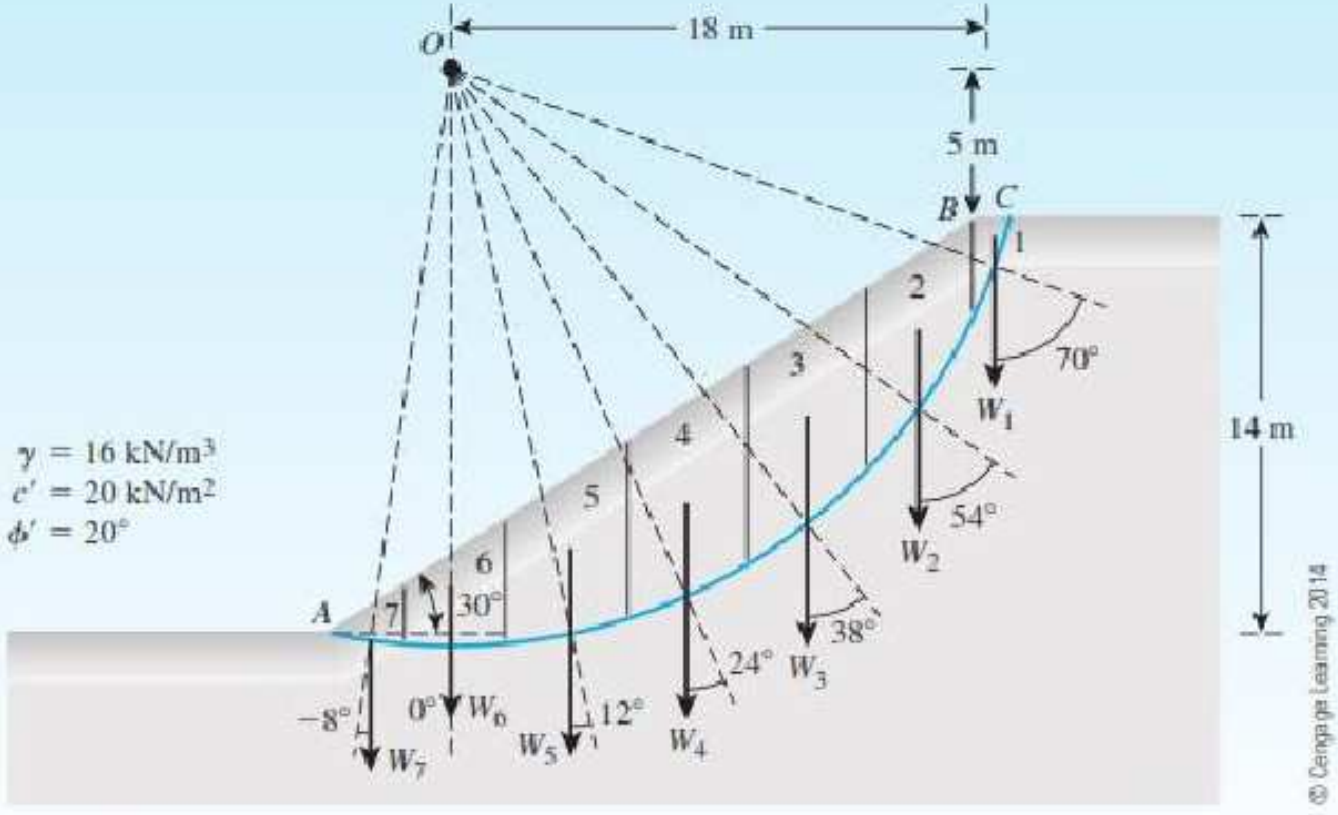
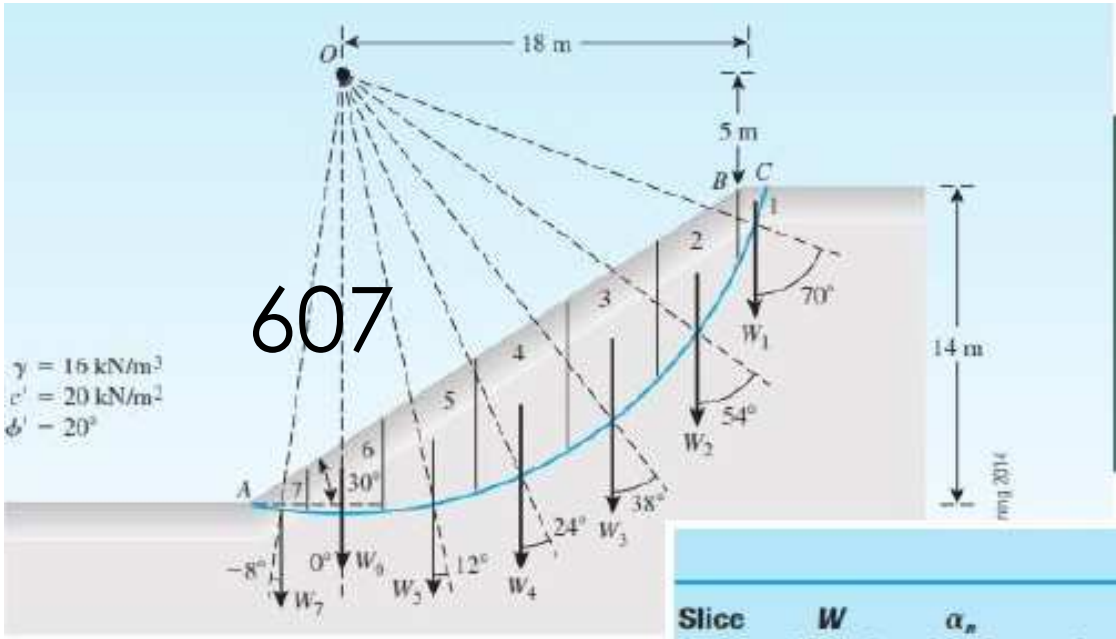


Figure 15.31 Stability analysis of a slope by ordinary method of slices



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Figure 15.31 Stability analysis of a slope by ordinary m

Slice no. (1)	W (kN/m) (2)	α_n (deg) (3)	$\sin \alpha_n$ (4)	$\cos \alpha_n$ (5)	ΔL_n (m) (6)	$W_n \sin \alpha_n$ (kN/m) (7)	$W_n \cos \alpha_n$ (kN/m) (8)
1	22.4	70	0.94	0.342	2.924	21.1	7.66
2	294.4	54	0.81	0.588	6.803	238.5	173.1
3	435.2	38	0.616	0.788	5.076	268.1	342.94
4	435.2	24	0.407	0.914	4.376	177.1	397.8
5	390.4	12	0.208	0.978	4.09	81.2	381.8
6	268.8	0	0	1	4	0	268.8
7	66.58	−8	−0.139	0.990	3.232	−9.25	65.9
					Σ Col. 6 = 30.501 m	Σ Col. 7 = 776.75 kN/m	Σ Col. 8 = 1638 kN/m

"The problem is solved by an ordinary slice method"

$$F_s = \frac{(\Sigma \text{ Col. 6})(c') + (\Sigma \text{ Col. 8}) \tan \phi'}{\Sigma \text{ Col. 7}}$$

$$= \frac{(30.501)(20) + (1638)(\tan 20)}{776.75} = \mathbf{1.55}$$

Prepared by Ali Imron

THANK YOU SO MUCH FOR ANY OF YOUR ATTERNTION