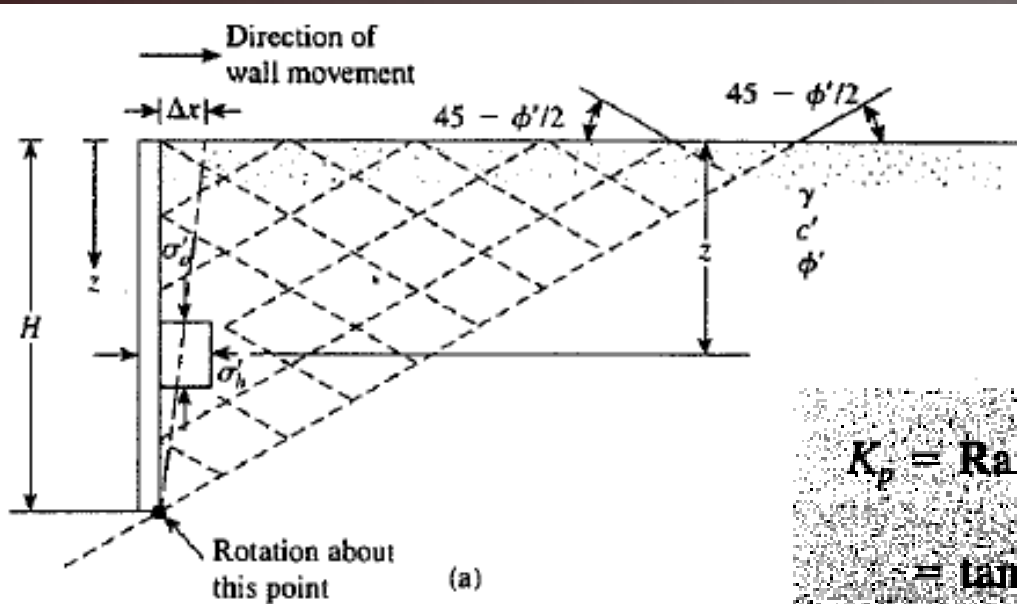
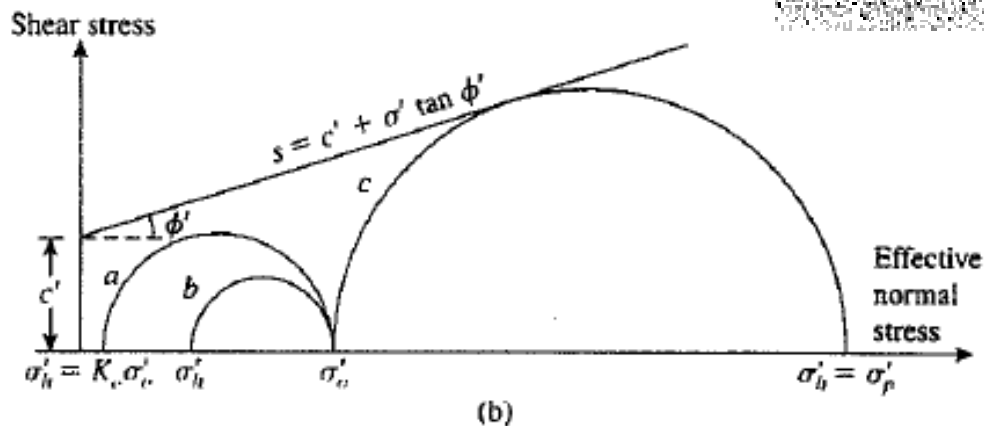

TEORI TEKANAN TANAH LATERAL

RANKINE-PASIF-KOHESIF

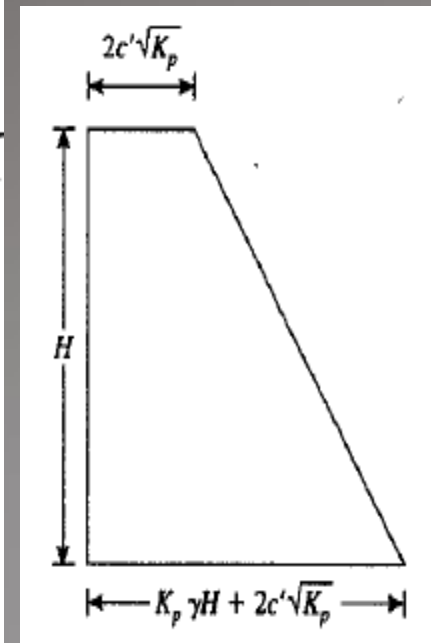
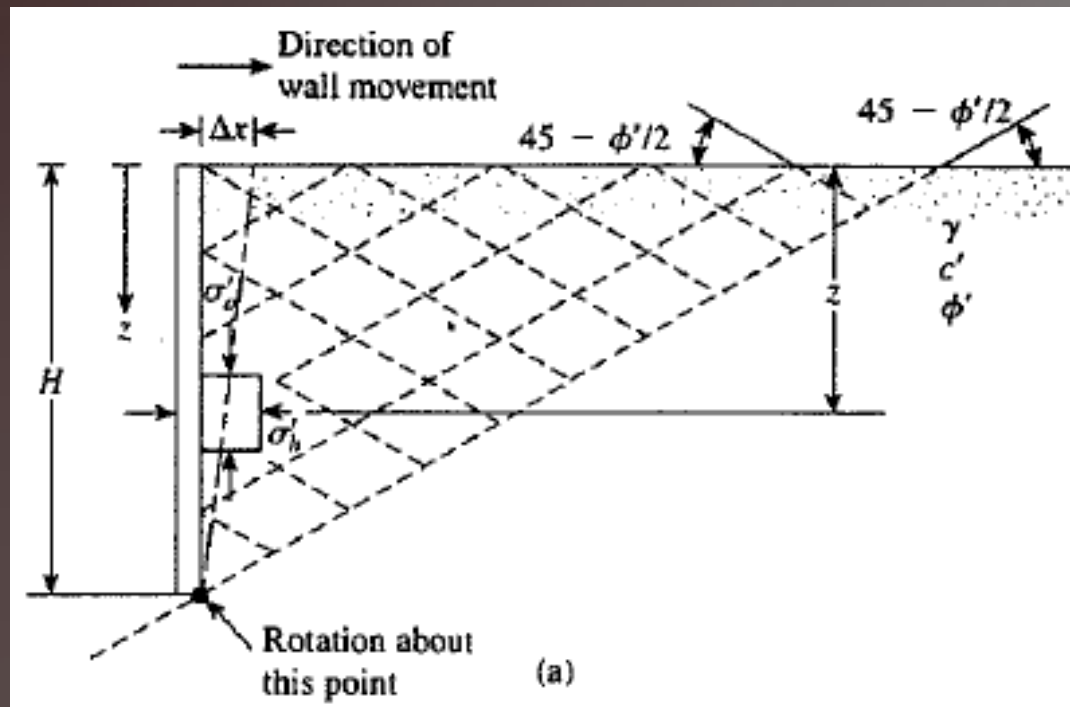


K_p = Rankine passive earth pressure coefficient

$$= \tan^2 \left(45 + \frac{\phi'}{2} \right)$$



RANKINE-PASIF-KOHESIF

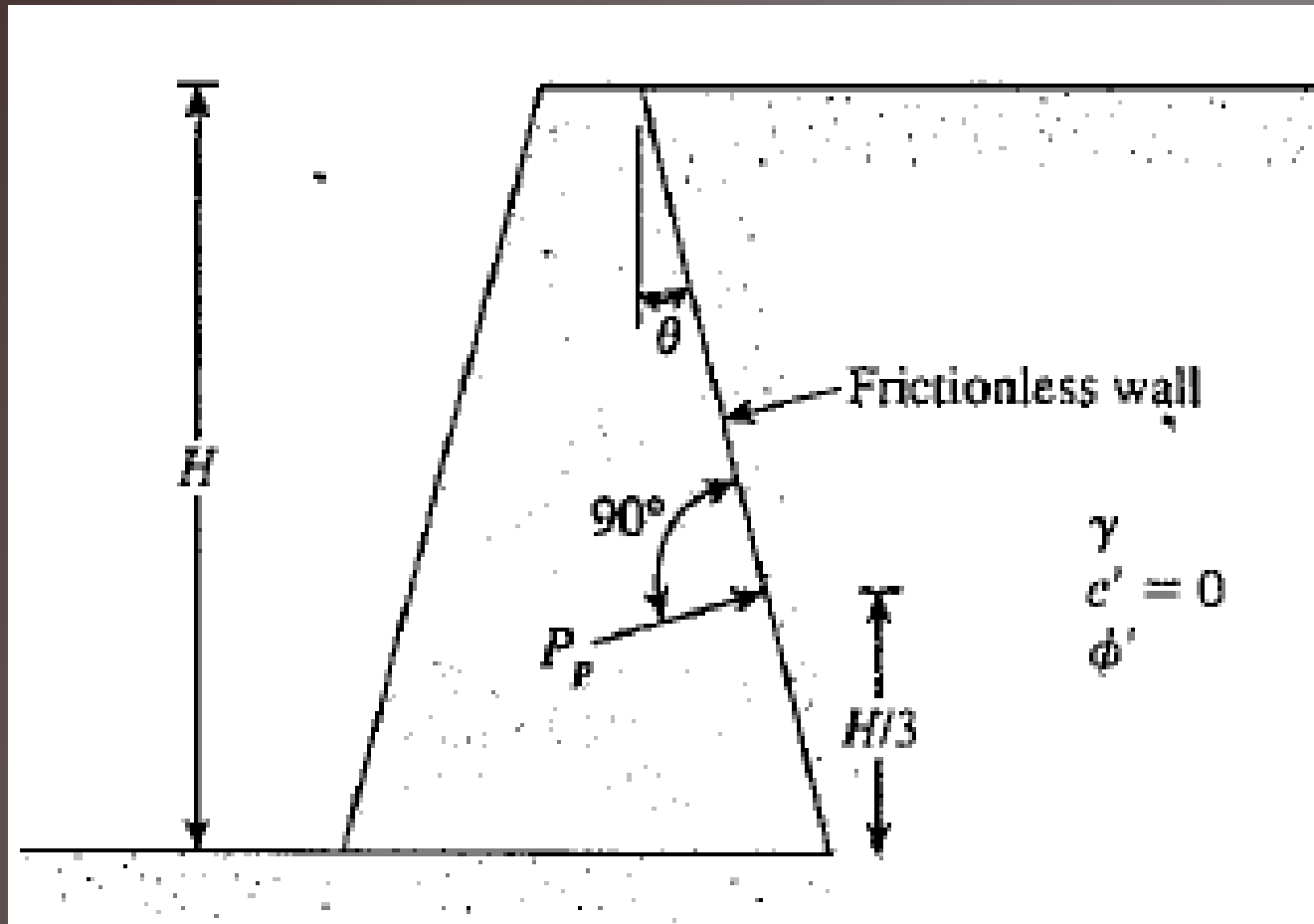


RANKINE-PASIF-KOHESIF

WARNING !!

Soil type	Wall movement for passive condition, Δx
Dense sand	$0.005H$
Loose sand	$0.01H$
Stiff clay	$0.01H$
Soft clay	$0.05H$

RANKINE-PASIF-NON KOHESIF



RANKINE-PASIF-NON KOHESIF

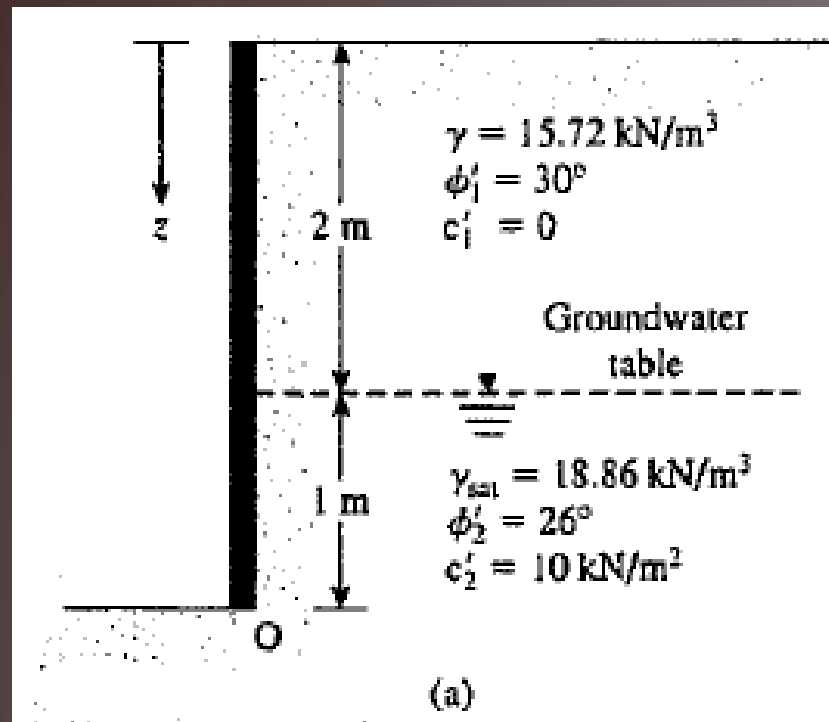
Table 7.8 Variation of K_p [see Eq. (7.48) and Figure 7.22]*

ϕ' (deg)	θ (deg)						
	30	25	20	15	10	5	0
20	1.70	1.69	1.72	1.77	1.83	1.92	2.04
21	1.74	1.73	1.76	1.81	1.89	1.99	2.12
22	1.77	1.77	1.80	1.87	1.95	2.06	2.20
23	1.81	1.81	1.85	1.92	2.01	2.13	2.28
24	1.84	1.85	1.90	1.97	2.07	2.21	2.37
25	1.88	1.89	1.95	2.03	2.14	2.28	2.46
26	1.91	1.93	1.99	2.09	2.21	2.36	2.56
27	1.95	1.98	2.05	2.15	2.28	2.45	2.66
28	1.99	2.02	2.10	2.21	2.35	2.54	2.77
29	2.03	2.07	2.15	2.27	2.43	2.63	2.88
30	2.07	2.11	2.21	2.34	2.51	2.73	3.00
31	2.11	2.16	2.27	2.41	2.60	2.83	3.12
32	2.15	2.21	2.33	2.48	2.68	2.93	3.25
33	2.20	2.26	2.39	2.56	2.77	3.04	3.39
34	2.24	2.32	2.45	2.64	2.87	3.16	3.53
35	2.29	2.37	2.52	2.72	2.97	3.28	3.68
36	2.33	2.43	2.59	2.80	3.07	3.41	3.84
37	2.38	2.49	2.66	2.89	3.18	3.55	4.01
38	2.43	2.55	2.73	2.98	3.29	3.69	4.19
39	2.48	2.61	2.81	3.07	3.41	3.84	4.38
40	2.53	2.67	2.89	3.17	3.53	4.00	4.59
41	2.59	2.74	2.97	3.27	3.66	4.16	4.80
42	2.64	2.80	3.05	3.38	3.80	4.34	5.03
43	2.70	2.88	3.14	3.49	3.94	4.52	5.27
44	2.76	2.94	3.23	3.61	4.09	4.72	5.53
45	2.82	3.02	3.32	3.73	4.25	4.92	5.80

*Based on Zhu and Qian, 2000

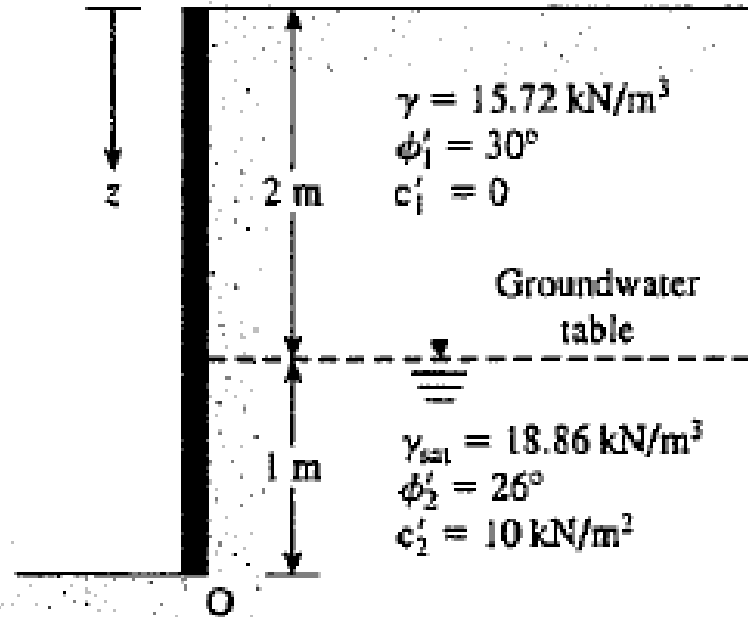
Contoh

A 3-m high wall is shown in Figure 7.23a. Determine the Rankine passive force per unit length of the wall.

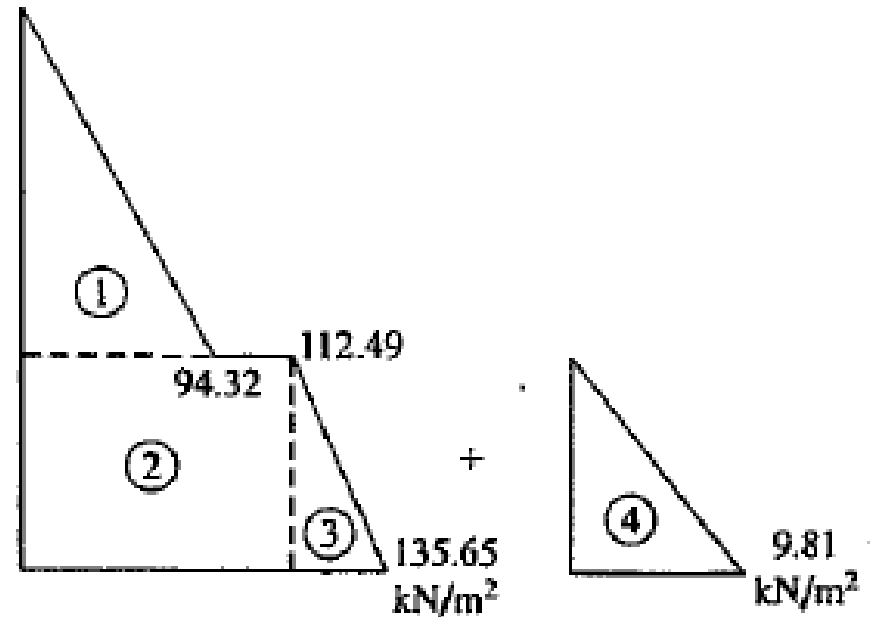


Contoh

A 3-m high wall is shown in Figure 7.23a. Determine the Rankine passive force per unit length of the wall.



(a)



(b)

Contoh

Solution

For the top layer

$$K_{p(1)} = \tan^2 \left(45 + \frac{\phi'_1}{2} \right) = \tan^2(45 + 15) = 3$$

From the bottom soil layer

$$K_{p(2)} = \tan^2 \left(45 + \frac{\phi'_2}{2} \right) = \tan^2(45 + 13) = 2.56$$

$$\sigma'_p = \sigma'_0 K_p + 2c' \sqrt{K_p}$$

Contoh

where

σ'_o = effective vertical stress

at $z = 0$, $\sigma'_o = 0$, $c'_1 = 0$, $\sigma'_p = 0$

at $z = 2$ m, $\sigma'_o = (15.72)(2) = 31.44$ kN/m², $c'_1 = 0$

So, for the top soil layer

$$\sigma'_p = 31.44K_{p(1)} + 2(0)\sqrt{K_{p(1)}} = 31.44(3) = 94.32 \text{ kN/m}^2$$

At this depth, that is $z = 2$ m, for the bottom soil layer

$$\begin{aligned}\sigma'_p &= \sigma'_o K_{p(2)} + 2c'_2 \sqrt{K_{p(2)}} = 31.44(2.56) + 2(10)\sqrt{2.56} \\ &= 80.49 + 32 = 112.49 \text{ kN/m}^2\end{aligned}$$

Again, at $z = 3$ m,

$$\sigma'_o = (15.72)(2) + (\gamma_{\text{sat}} - \gamma_w)(1)$$

Contoh

$$= 31.44 + (18.86 - 9.81)(1) = 40.49 \text{ kN/m}^2$$

Hence,

$$\begin{aligned}\sigma'_p &= \sigma'_O K_{p(2)} + 2c'_2 \sqrt{K_{p(2)}} = 40.49(2.56) + (2)(10)(1.6) \\ &= 135.65 \text{ kN/m}^2\end{aligned}$$

Note that, because a water table is present, the hydrostatic stress, u , also has to be taken into consideration. For $z = 0$ to 2 m, $u = 0$; $z = 3$ m, $u = (1)(\gamma_w) = 9.81 \text{ kN/m}^2$.

The passive pressure diagram is plotted in Figure 6.26b. The passive force per unit length of the wall can be determined from the area of the pressure diagram as follows:

Area No.	Area	
1	$(\frac{1}{2})(2)(94.32)$	= 94.32
2	$(112.49)(1)$	= 112.49
3	$(\frac{1}{2})(1)(135.65 - 112.49)$	= 11.58
4	$(\frac{1}{2})(9.81)(1)$	= 4.905
		$P_p \approx 223.3 \text{ kN/m}$