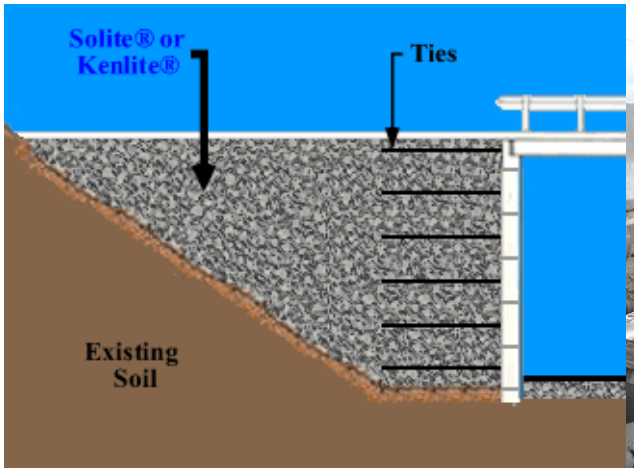
MSE Wall Project

Geotechnical Design

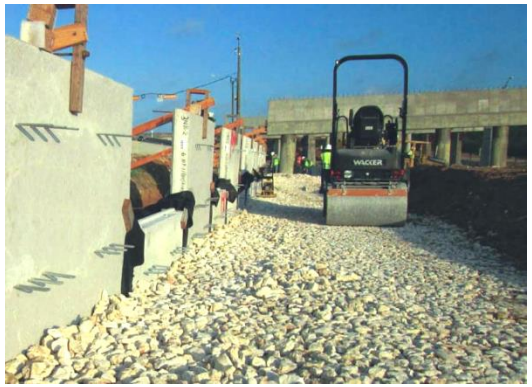
CEG 4801

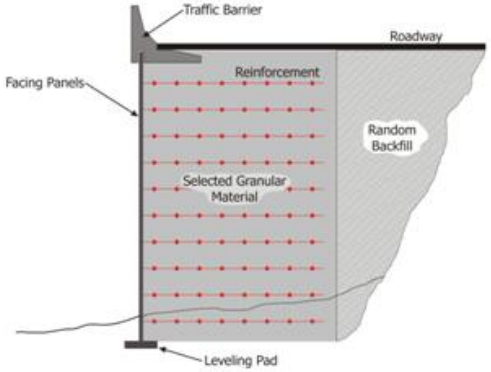
Fall 2019

Kamal Tawfiq, Ph.D., P.E.

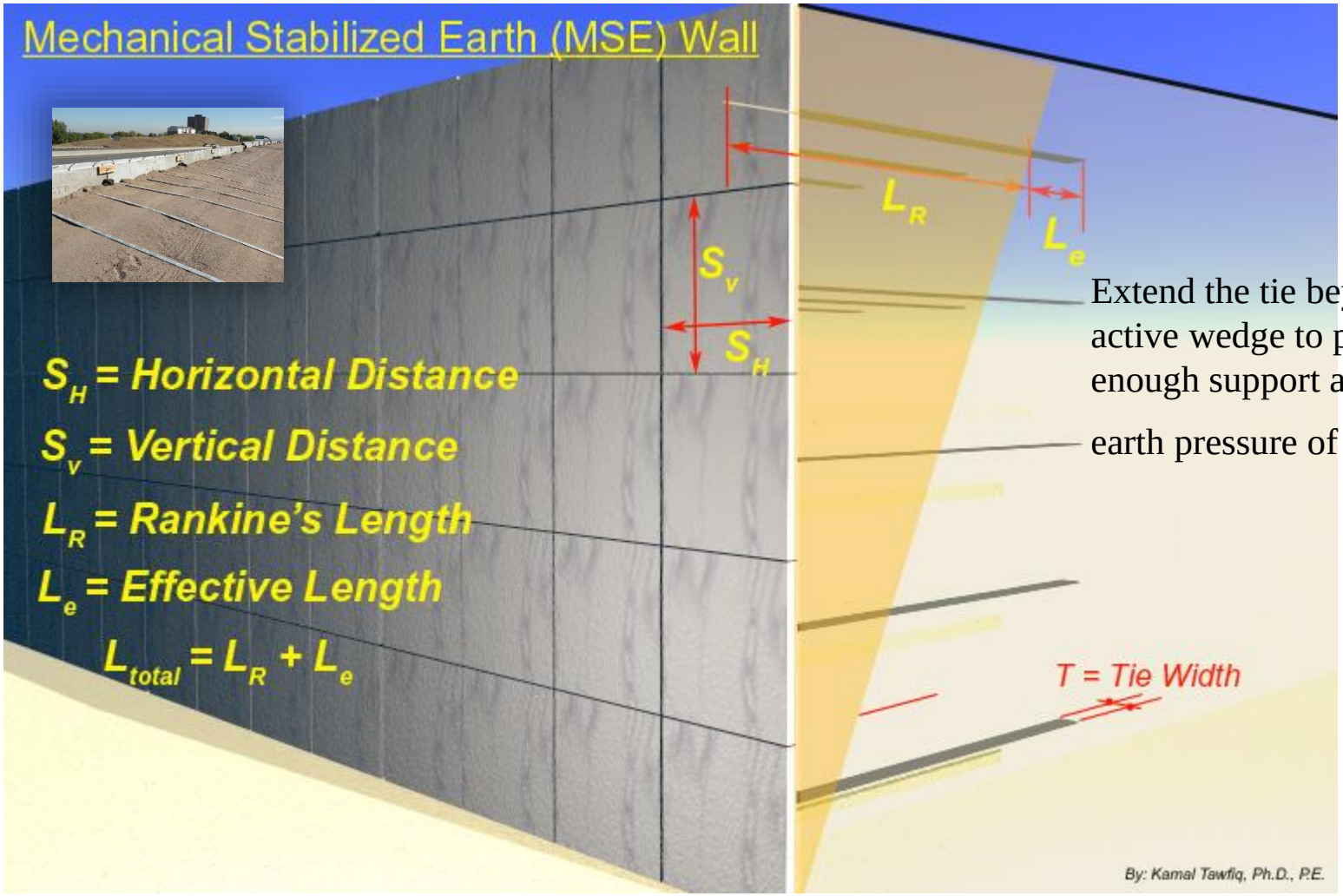

Solite® or
Kenlite®
Ties
Existing
Soil


EXPO COPYRIGHTED 2010




Traffic Barrier
Roadway
Reinforcement
Facing Panels
Random
Backfill
Selected Granular
Material
Leveling Pad

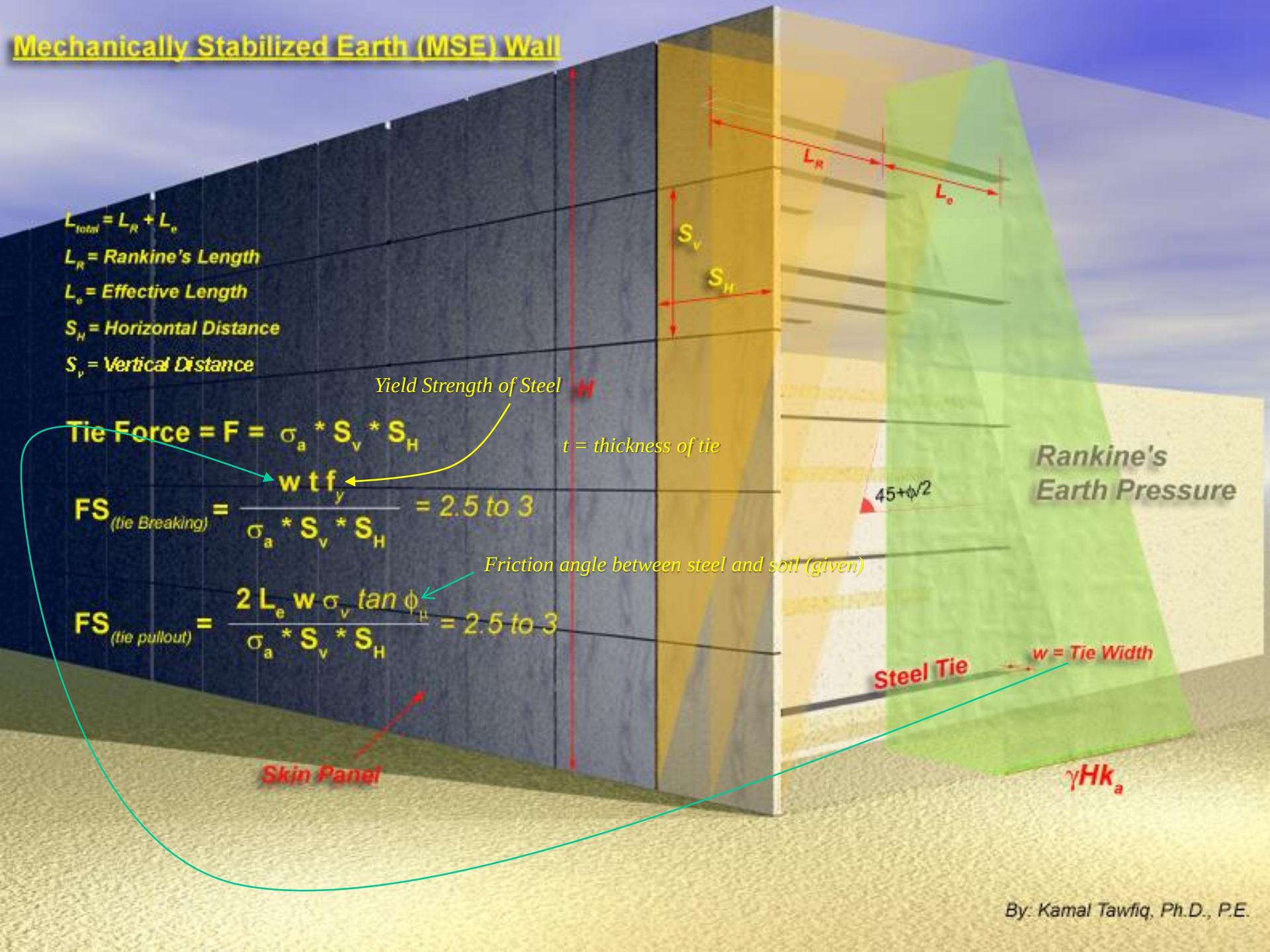
Design Concept



Extend the tie beyond the active wedge to provide enough support against

earth pressure of the panel

Mechanically Stabilized Earth (MSE) Wall

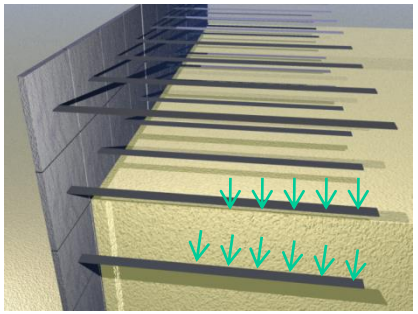


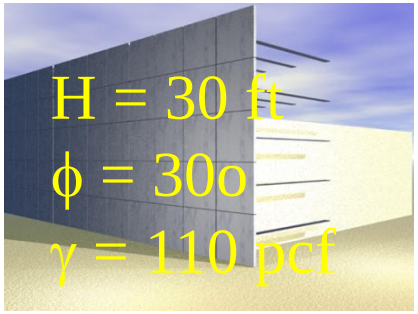
By: Kamal Tawfiq, Ph.D., P.E.

$L_{R1} = (H - 0.5\ S_v) \tan(45 - \phi/2)$

$$L_{e1} = \frac{2.5(\sigma_a . S_v . S_H)}{2\ w\ \sigma_v \tan\phi_\mu}$$

$L_1 = L_{R1} + L_{e1}$





Kamal Tawfiq, Ph.D., P.E.

$L_{R1} = (H - d_1) \tan(45 - \phi/2)$

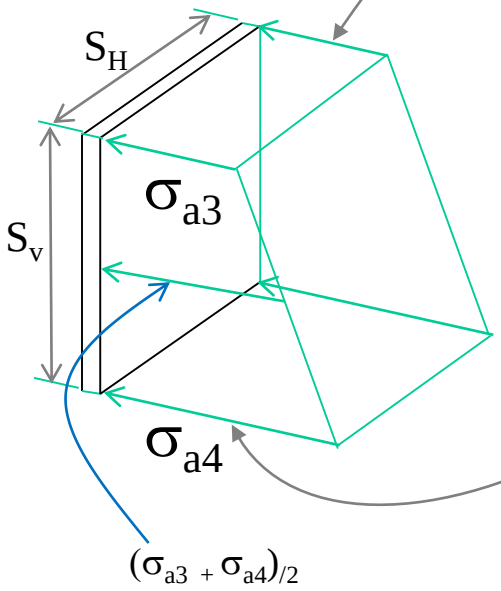
$$L_{e1} = \frac{2.5(\sigma_a . S_v . S_H)}{2\, w\, \sigma_v \tan\phi_\mu}$$

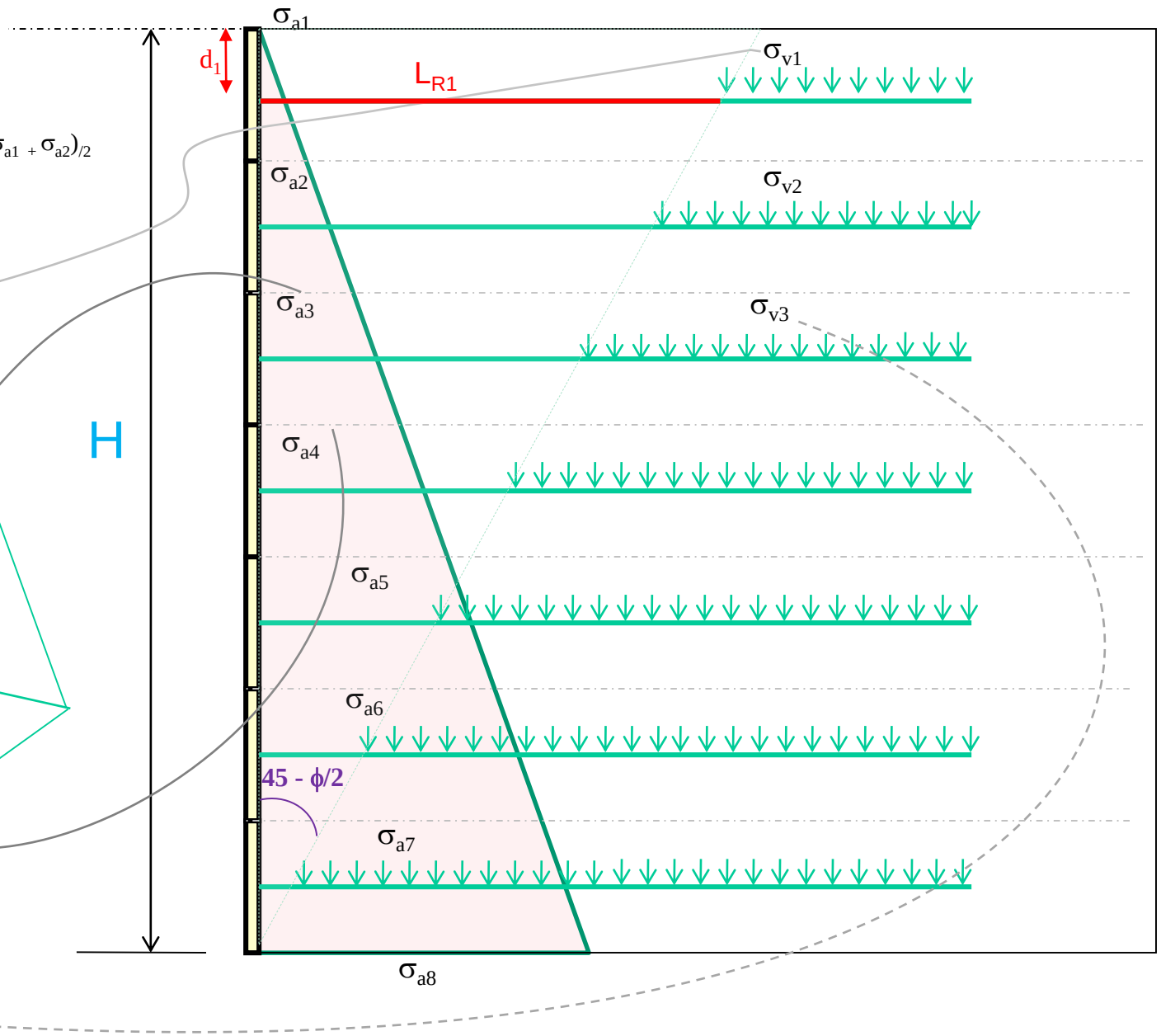
$(\sigma_{a1} + \sigma_{a2})/2$

Tie width

$L_1 = L_{R1} + L_{e1}$

For Example





or = $\sigma_{v3}\, k_a$

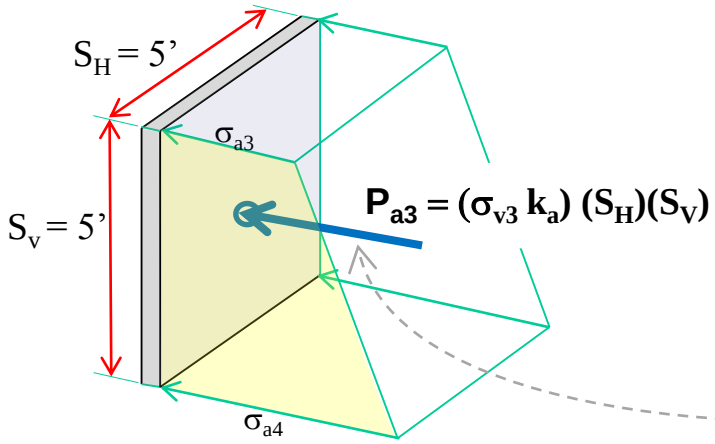
Kamal Tawfiq, Ph.D., P.E.

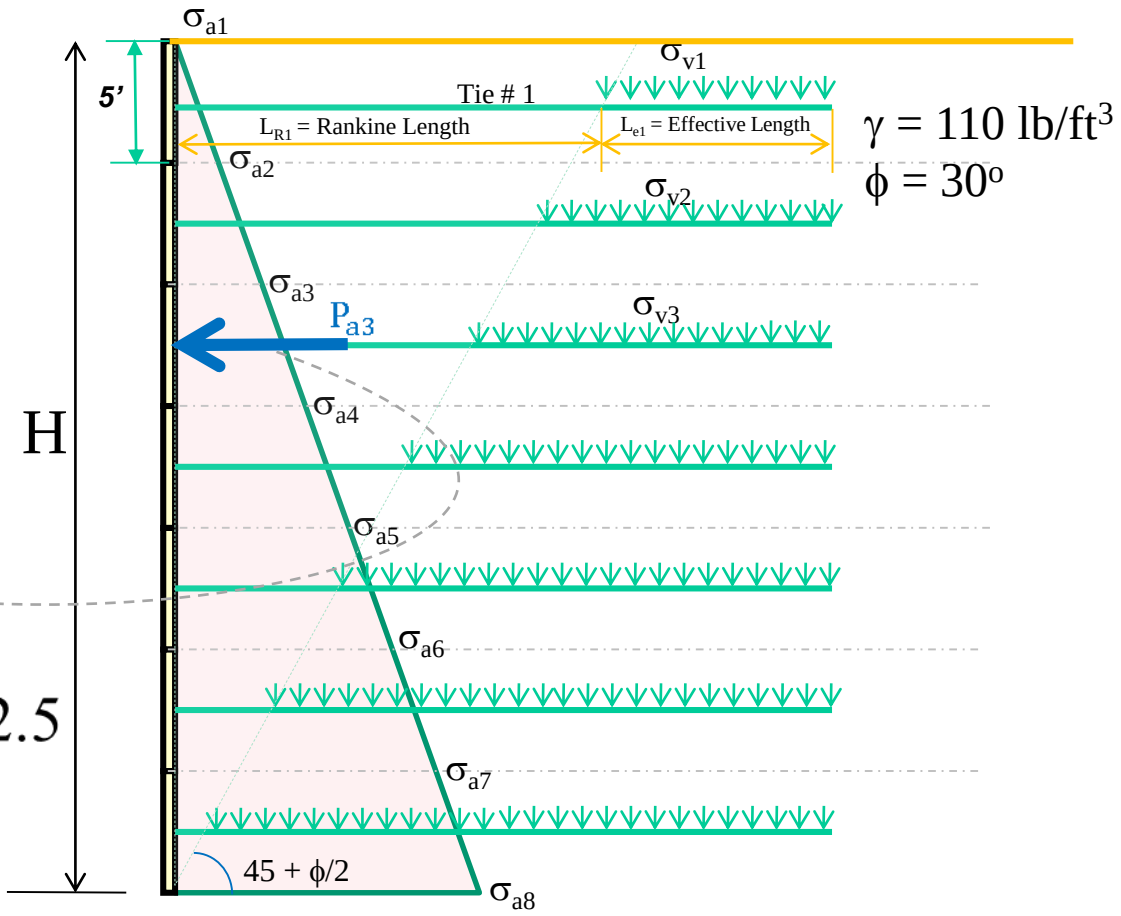
Homework Problem:

A reinforced earth retaining wall is to be **35 ft high**. The properties of the backfill material are $\gamma = 110$ lb/ft^3 and $\varphi = 30^o$. Galvanized steel ties are to be used for the construction of the wall. Design the Reinforcements with $FS_{(B)} = 3$, $FS_{(p)} = 3$, $f_y = 29{,}000$ psi and $\varphi_{tie} = 20^o$. The properties of the in-situ soil below the retaining wall are $\gamma = 120$ lb/ft^3, $\varphi = 30^o$, and c = 150 lb/ft^2. Design the panels and the ties of the wall.

$L_{R1} = 47.6$ ft

$L_{e1} = 30$ ft





$$F.S_{pullout} = \frac{2\, L_e\, w\, \sigma_v\, tan\delta}{\sigma_v\, k_a\, S_v\, S_h} = 2.5$$

$$F.S_{tie\ breaking} = \frac{t\, w\, f_y}{(\sigma_v\, k_a) S_v\, S_h} = 2.5 \text{ to } 3$$

Solution:

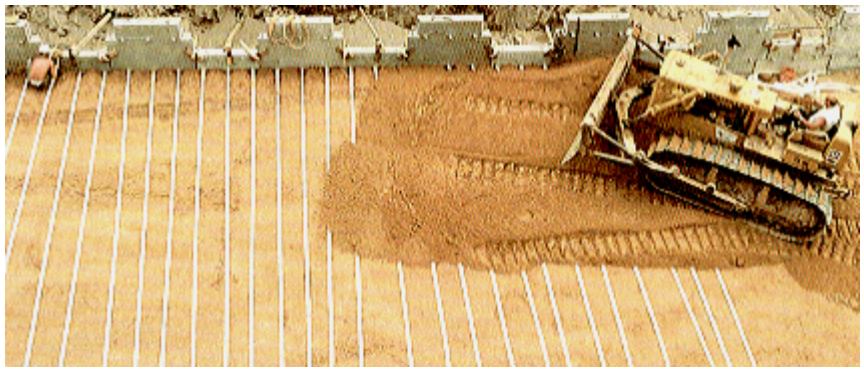
Solution:

$$F.S_{tie\ breaking} = \frac{t\ w\ f_y}{(\sigma_v\ k_a) S_v\ S_h} = 2.5 \text{ to } 3$$

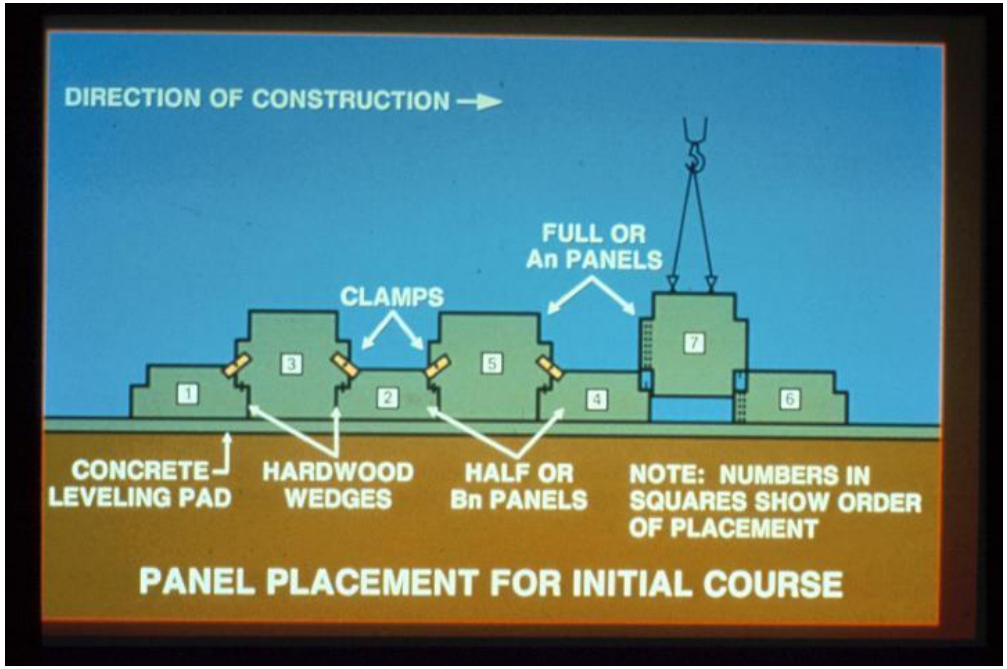
$$F.S_{pullout} = \frac{2\ L_e\ w\ \sigma_v\ tan\delta}{\sigma_v\ k_a\ S_v\ S_h} = 2.5 \text{ to } 3$$

H	35	ft
γ	110	pcf
ϕ	30	Degree
δ	20	Degree
k_a	0.33	
k_p	3	
w	3	in
f_y	36,000	psi
F.S	3	
S_v	5	ft
S_h	5	ft

Panel	Tie	Depth, D (ft)	Vetical Stress psf	Lateral Stress (psf)	$s_v\ k_a\ S_v\ S_h$	$2\ w\ s_v\ tan\delta$	$w\ f_y$	$L_{e\ (ft)}$	$L_{R\ (ft)}$	$L_{total\ (ft)}$	t (ft)	t (in)



Kamal Tawfiq, Ph.D., P.E.


DIRECTION OF CONSTRUCTION
FULL OR
An PANELS
CLAMPS
1
2
3
4
5
6
7
CONCRETE
LEVELING PAD
HARDWOOD
WEDGES
HALF OR
Bn PANELS
NOTE: NUMBERS IN
SQUARES SHOW ORDER
OF PLACEMENT
PANEL PLACEMENT FOR INITIAL COURSE