Homework 4 - Geotechnical Engineering
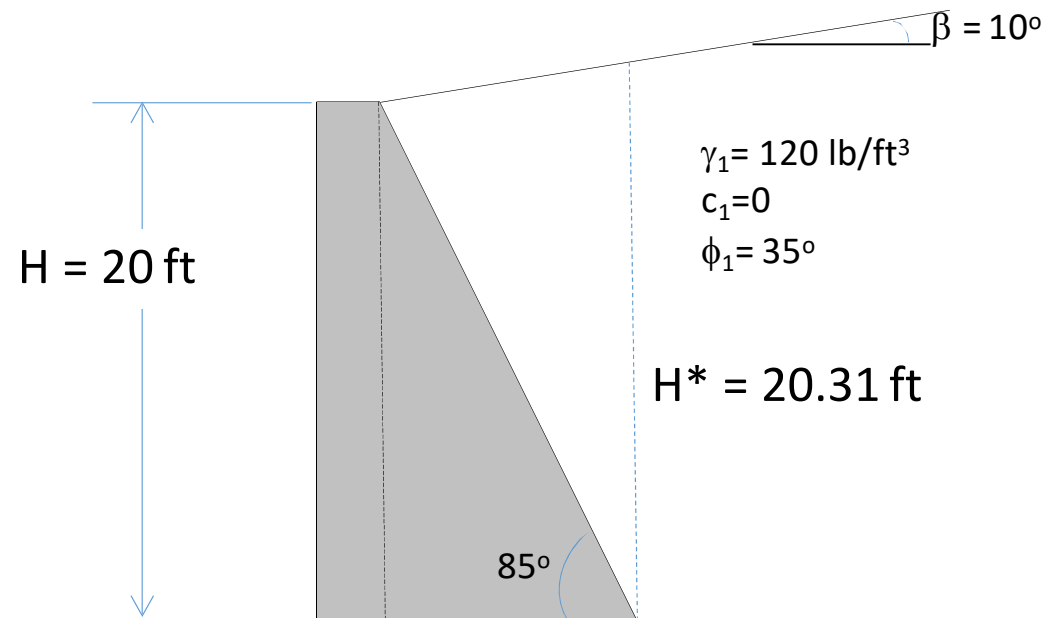
1) Find the total active earth pressure per foot of the wall for the following situation. Use Rankine's method

$\beta = 10°$

$\gamma_1 = 120$ lb/ft³
$c_1 = 0$
$\phi_1 = 35°$

H = 20 ft

H* = 20.31 ft

85°

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2) For the following situation, considering the angle of wall friction between backfill and wall δ is 20°, find the active earth pressure per foot of wall by Coulomb theory.

$\beta = 10°$

$\gamma_1 = 120$ lb/ft³
$c_1 = 0$
$\phi_1 = 35°$

H = 20 ft

H* = 20.31 ft

85°
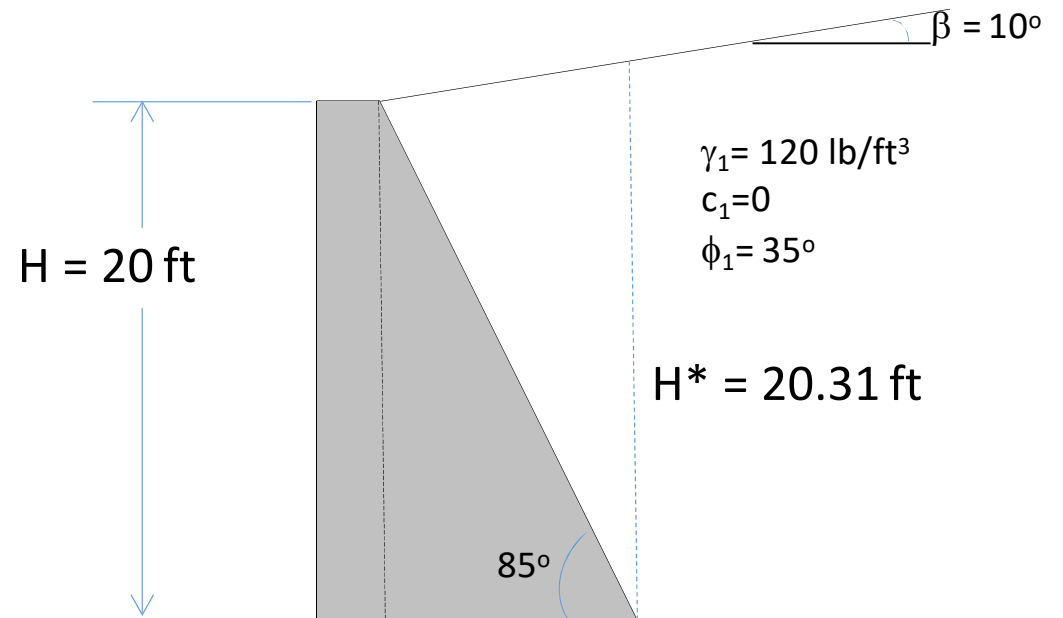
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3- Given

−A smooth vertical wall is 20 high and retains a cohesionless soil with γ = 120 lb/ft³, and ϕ = 28º.

−The top of the soil is horizontal and level with the top of the wall.

−The soil surface carries a uniformly distributed load of 1000

Required:

−Total active earth pressure on the wall per linear foot of wall.

−Point of action of the total active earth pressure by Rankine theory.

q = 1000 lb/ft

γ

ϕ

H

Vertical
Surface
$\theta = 0$

Smooth Surface
$\delta = 0$
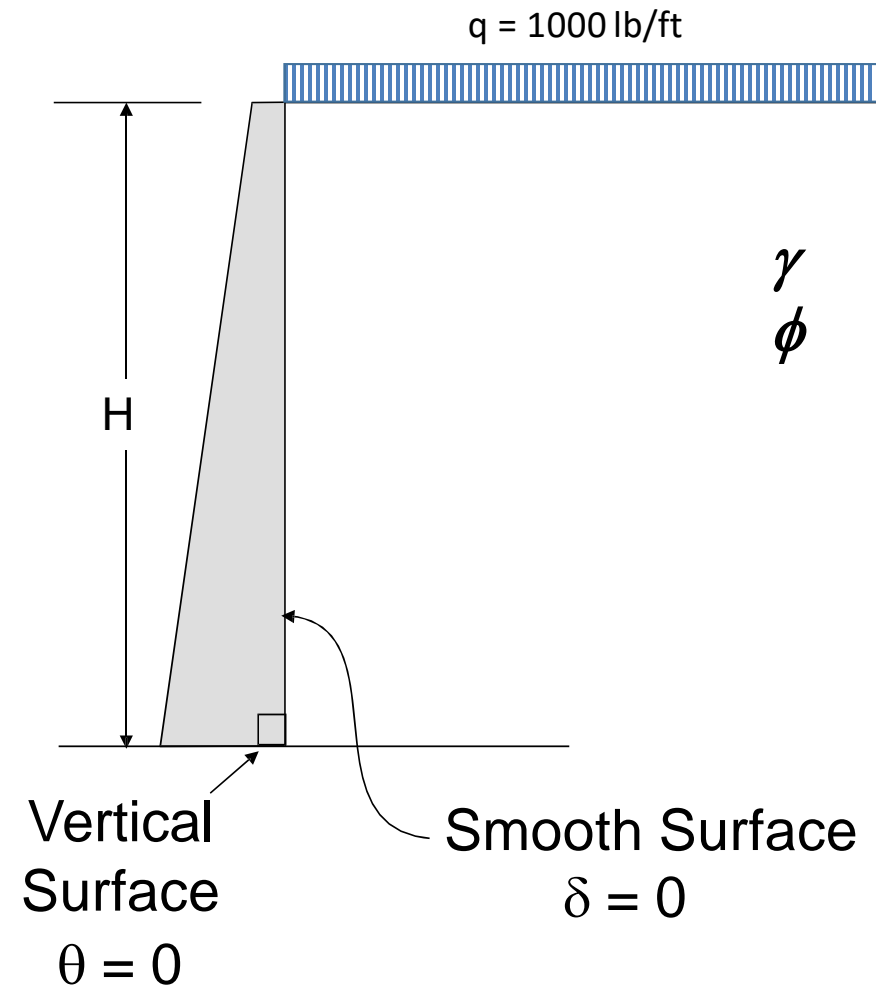
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4) For the cantilever retaining wall shown in the following figure, let the following data be given:

Wall dimensions: H = 18 ft, X_1=18 in, X_2=30 in., X_3=4 ft, X_4, 6ft, X_5=2.75 ft, α=10°, D = 4 ft

Soil properties: γ_1 = 117 lb/ft³, ϕ_1=34°, γ_2=110 lb/ft³, ϕ_2 =18°, c_2= 800 lb/ft²

Calculate the factor of safety with respect to

1- Sliding Failure

2- Overturning Failure

3- Foundation Failure

$\alpha = 10°$

γ_1= 117pcf
c_1=0
ϕ_1=

γ_2= 110 pcf
c_2= 800 psf
ϕ_2=18°

$\gamma_{concrete}$ = 150 pcf