36.1

$k = soil\ charecteristc(when\ unknown\ use\ the\ following) = 0.3$

$w = soil\ density = 100\frac{lb}{ft^3}$

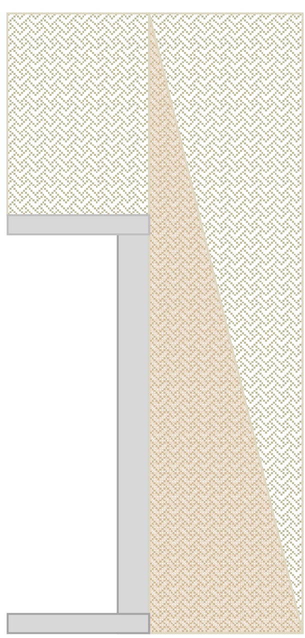
$h_c = height\ of\ wall = \_\_\_\_\_\_$

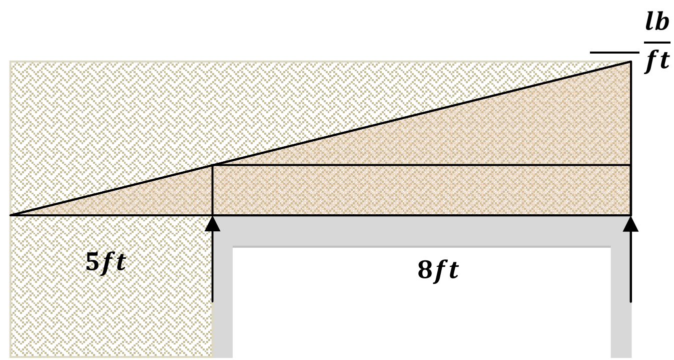
$P_e = max\ lateral\ fuid\ pressure = kwh_c = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\frac{lb}{ft^2}$

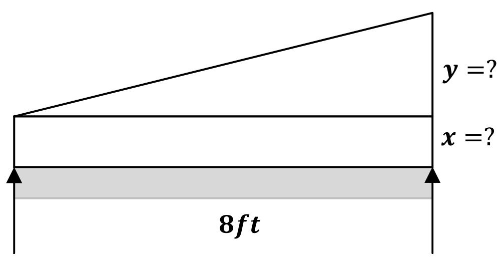
Furthermore, to simplify the problem, we will consider a 1ft wide section of the wall.
See concrete wall diagram.
This will simplify our units to ____$\frac{lb}{ft}$. However this value must still be factored for LRFD.

$1.6\left(\_\_\_\_\_\frac{lb}{ft}\right) = \_\_\_\_\_\_\_\_\boldsymbol{\frac{lb}{ft}}$

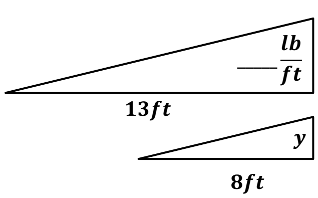
The load and span, shear and moment diagram can be visualized as a beam.







Use similar triangles to find the pressure distribution value at the second end of the simplified diagram.



$$\frac{(13ft)}{\_\_\_\frac{lb}{ft}} = \frac{8ft}{y}$$

$$13ft(y) = 8ft\left(\_\_\_\frac{lb}{ft}\right)$$

$$y = \_\_\_\_\_\_\_\frac{lb}{ft}$$

$$x = \_\_\_\_\_\_\_\frac{lb}{ft} - y = \_\_\_\_\_\_\_\frac{lb}{ft}$$

To simplify the problem, analyze the loading as a rectangle and a square.

Find the total load W:

$$Area\ of\ a\ Triange = \frac{1}{2}(base)height$$

$$W_T = \frac{1}{2}(8ft)\_\_\_\_\_\frac{lb}{ft} = \_\_\_\_\_lb$$

$$Area\ of\ a\ rectangle = (base)height$$

$$W_S = (8ft)\_\_\_\_\_\frac{lb}{ft} = \_\_\_\_\_lb$$

Find Shear Max V:

$$Max\ shear\ of\ a\ \ triangular\ load\ \ = \frac{2}{3}W_T$$

$$V_T = \frac{2}{3}(\_\_\_\_\_lb) = \_\_\_\_\_lb$$

$$Max\ shearof\ a\ rectangular\ load = \frac{1}{2}W_S$$

$$V_S = \frac{1}{2}(\_\_\_\_\_lb) = \_\_\_\_\_\ lb$$

Find the Total Shear

$$V_u = V_T + V_S = \_\_\_\_\_\ lb\ ft + \_\_\_\_\_\ lb\ ft = \_\_\_\_\_\boldsymbol{lb}$$

Find Max Moment M:

$$Max\ moment\ of\ a\ rectangular\ load = 0.1283W_TL$$

$$M_T = \frac{2}{3}(\_\_\_\_\_lb) = \_\_\_\_\_lb\ ft$$

$$Max\ moment\ of\ a\ \ rectangular\ load = \frac{W_SL}{8}$$

$$M_S = \frac{1}{2}(\_\_\_\_\_lb) = \_\_\_\_\_lb\ ft$$

Find the Total Moment

$$M_u = M_T + M_S = \_\_\_\_\_lb\ ft + \_\_\_\_\_\ lb\ ft = \_\_\_\_\_lbft\left(\frac{12in}{1ft}\right) = \_\_\_\_\_lbin = \_\_\_\_\_\boldsymbol{k\ in}$$

To determine if a 8in wall will be adequate find the following:

1. **Find the depth required for the maximum moment**

   $$d_m = \sqrt{\frac{M_u}{\Phi R b}}$$

2. **Find the depth required for the maximum shear**

   $$V_{crit} = V_u - (P_e)d_v$$

   $$f_v' = \frac{V_{crit}}{A}$$

3. **Find the code required depth**

   4in or L/25

Proceed with the following conditions:

$f_c' = 3000psi$
$F_y = 60000psi$
$\rho_{rec} =$ _____ $psi\ (from\ table\ A.4)$
$R = required\ reinforcement =$ _____ $psi\ (from\ table A.7)$
$b = 12in\ (one\ foot\ section\ of\ the\ wall)$
$M_u =$ _____ $k\ in$
$\phi = 0.9$
$P_e(at\ 13ft\ and\ factored\ ) =\ max\ lateral\ fuid\ pressure = kwh_c =$ _____ $\frac{lb}{ft}$
$f_v' =$ _____ $psi\ (table\ 31.1)$
$V_u =$ _____ lb

Find the depth required for the maximum moment

$$d_m = \sqrt{\frac{M_u}{\Phi R b}} = \sqrt{\frac{\_\_\_\_\_ k\ in}{(0.9)(\_\_\_\_\_)(12in)}} = \_\_\_\_\_ \boldsymbol{in}$$

Find the depth required for the maximum shear

$$V_{crit} = V_u - (P_e)d_v$$

$$f_v' = \frac{V_{crit}}{A}$$

Combine the equations:

$f_v' =$ _______________

Rearrange:

_____

_____

Factor:

d_v_____ $= V_u$

$$d_v = \frac{V_u}{(f_v' b + P_e)} = \frac{\_\_\_\_\_}{(\_\_\_\_\_ + \_\_\_\_\_)} = \_\_\_\_\_\boldsymbol{in}$$

<u>Find the code required depth</u>

Code requires 4in or L/25:

$$\frac{L}{25} = \frac{8ft\left(\frac{12in}{ft}\right)}{25} = \_\_\_\_\_in$$

Since _____$in < or > \ 4in$

$\boldsymbol{d_c} =$ _____

<u>Summarize conclusions:</u>

$\boldsymbol{d_m} =$ _____$\boldsymbol{in}$

$\boldsymbol{d_v} =$ _____$\boldsymbol{in}$

$\boldsymbol{d_c} =$ _____$\boldsymbol{in}$

Since they are _____......

<u>Size steel for the 8in wall depth:</u>

$b = 12in$

$d = 8in - 2in = 6in \ (2in \ is \ the \ concrete \ cover \ over \ the \ steel)$

$$d_m = \sqrt{\frac{M_u}{\Phi R b}}$$

Rearrange to find the actual required reinforcement value R:

$$R = \frac{M_u}{\Phi d^2 b} = \frac{\_\_\_\_\_k \ in}{\_\_\_\_\_\_\_\_\_\_} = \_\_\_\_\_psi$$

Use table A.8 to find R (however, the value is off the chart so use the minimum value of $\rho_g(aka \ \rho_{min}) =$ _____

$A_s = \rho_{min} A_c = (\_\_\_\_\_)12in(6in) = \_\_\_\_\_in^2 \ per \ one \ foot \ of \ spacing$

Try #_____ bar: Area= _____in^2

$$\frac{\_\_\_\_\_4in^2}{12in} = \frac{\_\_\_\_\_in^2}{spacing}$$

Spacing = _____with #_____ bar