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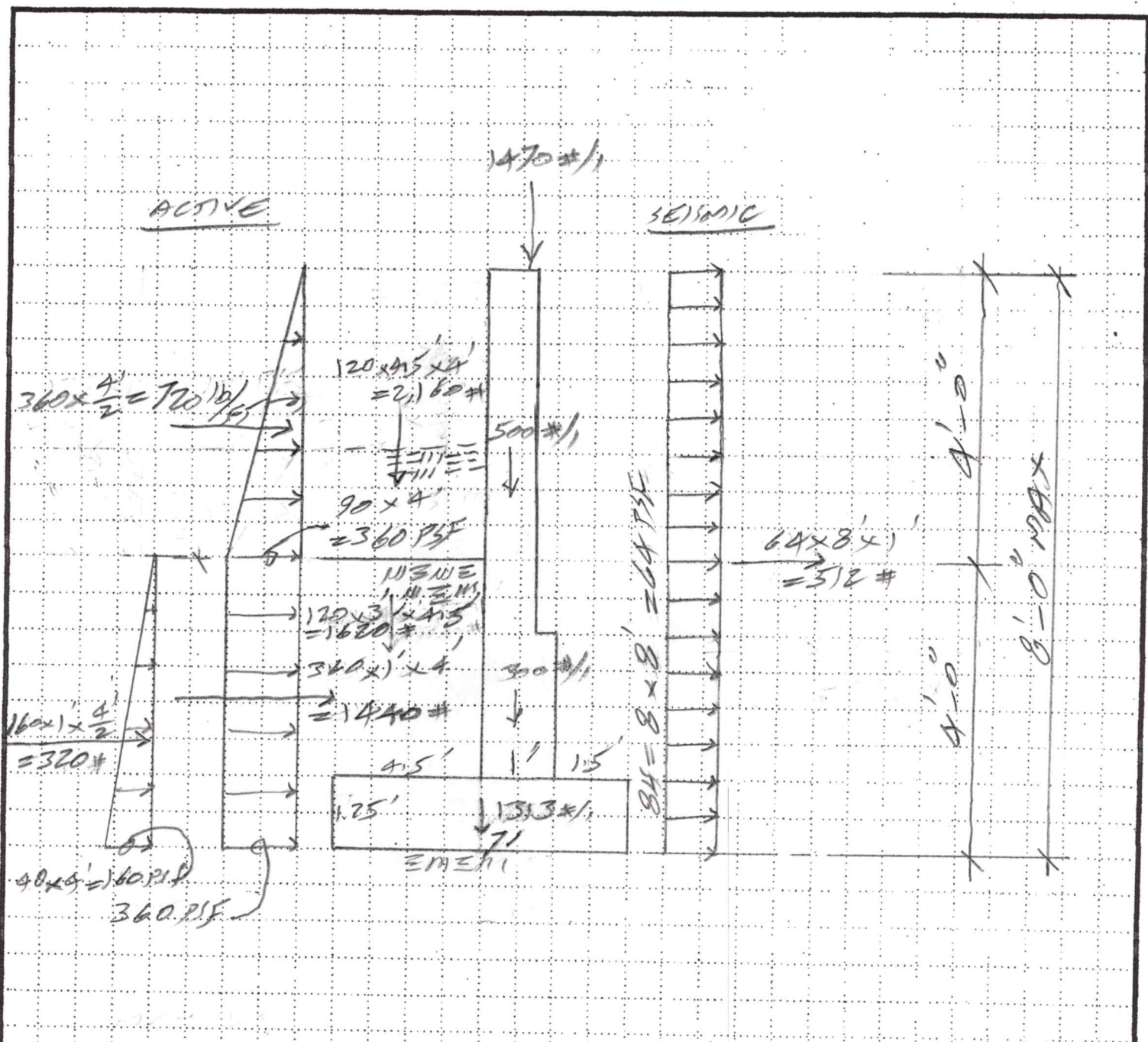
**EDWARD & CATHERINE MORAN
RESIDENCE
REVISED EAST CATCHMENT / R.W.**

**5000 WEST MERCER WAY
MERCER ISLAND, WASHINGTON 98040**

STRUCTURAL CALCULATIONS

**MARCH 31, 2023
JOB NO: 171-2101**





{ MAX H.T. = 8'-0"
 H ABOVE SOIL = 4'-0"
 { FTG L = 6'-0"
 { FTG T = 15"

{ ACTIVE PRESS. = 40 PSF (BOT. 4')
 = 90 PSF (TOP 4')
 { COEFF. OF FRICTION = 0.35
 SOIL BRG = 1500 PSF
 PASSIVE PRESS. = 200 PSF

$$\left\{ \begin{aligned} \text{ROOF TL} &= 40 \text{ PSF} \times 10' = 400 \text{ PLF} \\ \text{UPPER FLR} &= 55 \text{ PSF} \times \frac{14'}{2} = 385 \text{ PLF} \\ \text{MAIN FLR} &= 55 \text{ PSF} \times \frac{14'}{2} = 385 \text{ PLF} \\ \text{STUD WALL} &= 15 \text{ PSF} \times 20' = 300 \text{ PLF} \\ & \underline{1470 \text{ PLF}} \end{aligned} \right.$$

$$\left\{ \begin{aligned} 12'' \text{ WALL DL} &= 150 \times 1' \times 2' = 300 \text{ PLF} \\ 8'' \text{ WALL DL} &= 150 \times \frac{8''}{12} \times 5' = 500 \text{ PLF} \\ \text{FT. G DL} &= 150 \times 7.0' \times 1.25 = 1313 \text{ PLF} \end{aligned} \right.$$

CASE - I) R. W. + SEISMIC + BLDG LOAD

$$\begin{aligned} D_{o.f.} &= 320 \times \frac{4'}{3} + 1940 \times \frac{4'}{2} + 720(4' + \frac{4'}{3}) + 512 \times \frac{8.0'}{2} \\ &= 9,195 \# \end{aligned}$$

$$\begin{aligned} D_{r.} &= 1313 \times \frac{7.0'}{2} + 300 \times 2' + 500 \times 1.83' + 1470 \times 1.5' \\ &+ (1620 + 2160)(2.5' + \frac{4.5'}{2}) = 26,270 \# \end{aligned}$$

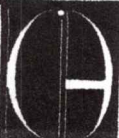
$$D_{NET} = 26,270 - 9,195 = 17,075 \#$$

$$P_{TL} = 1313 + 300 + 500 + 1470 + 2160 + 1620 = 7,363 \#$$

$$\frac{L}{2} = 17,075 / 7,363 = 2.33' \rightarrow L = 10'$$

$$\frac{1}{2} V_3 \times 7' = 7363 \rightarrow V_3 = 2104 \text{ PSF} \quad (500 \times 1.4 = 2100 \text{ PSF D.R.})$$

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Project/Subject

MORAN RESIDENCE
EAST CATCHMENT R. W.

By

A. G.

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$$V = 1440 + 320 + 720 + 512 = 2,992 \#$$

$$P_{TL} = 7,363 \#$$

$$\text{COEFF. OF FRICTION} = 0.35$$

$$0.35 \times 7,363 = 2,577 \# < 2,992 \# - \text{N.G.}$$

ADDING 2'-3" W/4 TO THE FTG

$$\text{FRESH} = 2,577 + 200 \times 2.25 \times \frac{2.25}{2} = 3,083 \# > 2,992 \# - \text{O.K.}$$

CASE-II) R.W. + SEISMIC

$$M_{O.I.T.} = 9,195 \#'$$

$$M_{O.} = 1313 \times \frac{7}{2} + 300 \times 2 + 500 \times 1.83 + (1620 + 2160) \left(\frac{2.5}{2} + \frac{4.5}{2} \right) \\ = 24,065 \#'$$

$$M_{I.B.T.} = 14,870 \#'$$

$$P_{TL} = 5,893 \#'$$

$$\frac{L}{3} = \frac{14,870}{5,893} = 2.5 \rightarrow L = 7.5'$$

$$M_{A.} = 9,195 + (500 + 300) \times 1.50 - (1620 + 2160) \times 1.25 \\ = 5,670 \#'$$

$$V_s = \frac{5893}{7 \times 1} + \frac{6 \times 5670}{1 \times 72} = 840 \pm 694$$

$$\left\{ \begin{array}{l} \Delta_{MAX} = 1536 \text{ PSF} - \text{O.K.} \\ \Delta_{MIN.} = 148 \text{ PSF} - \text{O.K.} \end{array} \right.$$

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WALL REINF. @ 12" WALL:

$$M_w = 1.6 \times \left[(14 \times 7' \times \frac{1'}{2}) + 720(3' + \frac{4'}{3}) + 360 \times 3' \times \frac{3'}{2} + 40 \times 3' \times \frac{3'}{2} \right]$$

$$= 10.38 \text{ k'/ft}$$

$$b = 12"$$

$$d = 8" \rightarrow F = 0.064$$

$$K_w = 10.38 / 0.064 = 162$$

$$P = 0.0033$$

$$A_s = 0.0033 \times 12 \times 8 = 0.317 \text{ in}^2/\text{ft}$$

#5 @ 12" o.c., VERT.

WALL REINF. @ 8" WALL:

$$M_w = 1.6 \times \left[(64 \times 5' \times \frac{5'}{2}) + 720(1' + \frac{4'}{3}) + 360 \times 1' \times \frac{1'}{2} + 40 \times 1' \times \frac{1'}{2} \right]$$

$$= 3.13 \text{ k'/ft}$$

$$b = 12"$$

$$d = 5.5" \rightarrow F = 0.03025$$

$$K_w = 3.13 / 0.03025 = 103$$

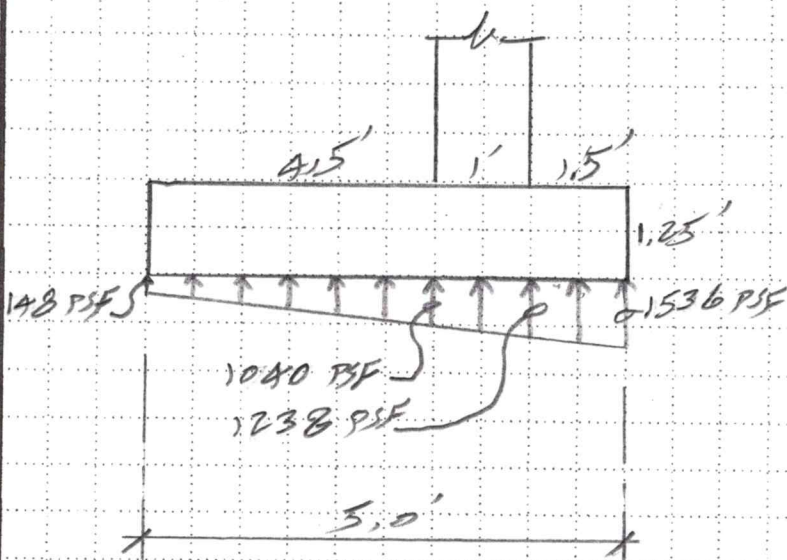
$$P = 0.002 \times 1.33 = 0.00266$$

$$A_s = 0.00266 \times 12 \times 5.5 = 0.18 \text{ in}^2/\text{ft}$$

#4 @ 12" o.c., VERT.



FTG DESIGN:



CASE-II

HEEL

$$M_u = (148 \times \frac{4.5^2}{2} + 1892 \times \frac{4.5}{2} \times \frac{4.5}{3}) \times 1.6$$

$$= 7.21 \text{ K'/ft}$$

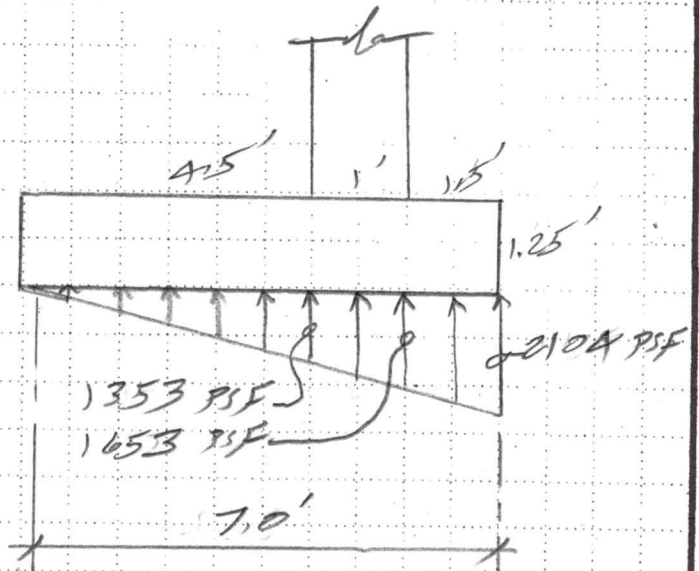
$b = 12"$

$d = 12" \rightarrow F = 0.144$

$K_u = 7.21 / 0.144 = 50$

$\rho = 0.0015 \times 1.33 = 0.0020$

$A_s = 0.002 \times 12 \times 12 = 0.29 \text{ in}^2/\text{ft}$
 #5 @ 12" o.c.



CASE-I

TOE

$$M_u = 1.6 \times 2104 \times 1.5^2 / 2 = 3.79 \text{ K'/ft}$$

$b = 12"$

$d = 9" \rightarrow F = 0.081$

$K_u = 3.79 / 0.081 = 47$

$\rho = 0.0015 \times 1.33 = 0.0020$

$A_s = 0.002 \times 12 \times 9 = 0.22 \text{ in}^2/\text{ft}$
 #5 @ 12" o.c.

HEEL

$$M_u = (1138 \times \frac{3^2}{2} \times 1) \times 1.6 = 2.73 \text{ K'/ft}$$

$K = 2.73 / 1.064 = 43$

$A_s = 0.002 \times 12 \times 8 = 0.192 \text{ in}^2/\text{ft}$
 #5 @ 12" o.c.

