## Stemwall Cont. Footing Calculator

Check continuous footings at highest (vertically) loaded section of wall excluding point loads.

From previous sections and by inspection the most critically loaded wall is at Wall Line 2

| (plf) | Dead Load | Floor Live | Roof Live | 0.6(Wind) |
|---|---|---|---|---|
| Roof | 426 | 0 | 481 | 0 |
| Wall | 108 | 0 | 0 | 0 |
| Floor | 7 | 27 | 0 | 0 |
| Stemwall | 150 | 0 | 0 | 0 |
| Wind | 0 | 0 | 0 | 40 |
| Totals | 690 | 27 | 481 | 40 |

| | |
|---|---|
| Roof LL or S = | 20.9 psf |
| Roof DL = | 18.5 psf |
| Roof Trib. Width = | 23.0 ft |
| Wall DL = | 12 psf |
| Wall Hgt. = | 9 ft |
| Floor LL = | 40.0 psf |
| Floor DL = | 10.0 psf |
| FloorTrib. Width = | 0.7 ft |
| Wind (ASD) = | 40.0 plf |

ASD Load Cases from ASCE 7-10:

2.) D + L =                                          717 plf

3.) D + (Lr or S) =                              1,171 plf        (governs)

6a.) D + .75L + .75(.6W) + .75(Lr or S) =   1,101 plf

| | |
|---|---|
| $\rho_{conc}$ = | 150 pcf |
| Steel Yield Strength = | 60,000 psi |
| Conc. Comp. Strength = | 3,000 psi |
| Soil Bearing Pressure = | 1,500 psf |
| Reinf. Cover = | 3 in |
| Reinf. Bar Size = | 4 |
| Soil Depth Above Ftg. = | 18 in |
| $\rho_{soil}$ = | 100 pcf |
| Stem Width = | 6 in |
| Stem Hgt. = | 24 in |
| Footing Width = | 12 in |
| Footing Depth = | 6 in |

Bearing Calculations:

| | | | |
|---|---|---|---|
| Applied Bearing Pressure | $Q_{asd}$ = | 1,171 psf | |
| Eff. Allowable SBP | $Q_e$ = | 1,350 psf | |
| Footing Width Required | $W_{req}$ = | 10.4 in | |
| Footing Width | $W_{footing}$ = | **12** in | ⟶ **OK** |

Strength Design Load Cases from ASCE 7-10:

1.) 1.4D =                                        966 plf

2.) 1.2D + 1.6L + .5(Lr or S) =              1,111 plf

3.) 1.2D + 1.6(Lr or S) + L =               1,624 plf        (governs)

4.) 1.2D + 1.0W + L + .5(Lr or S) =       1,162 plf

Beam Shear Calculations (One Way Shear):

| | | | |
|---|---|---|---|
| Ult. Applied Bearing Pressure | $Q_u$ = | 1,624 psf | |
| Applied Beam Shear | $V_u$ = | 101 lbs | |
| Allowable Beam Shear | $V_c$ = | 2,218 lbs (ACI 11-3) | |
| Footing Depth Required | $D_{req}$ = | 0.3 in | |
| Footing Depth | $D_{footing}$ = | **6.0** in | ⟶ **OK** |

Beam Shear Calculations (One Way Shear):
Unreinforced Concrete

| | | | |
|---|---|---|---|
| | $V_u$ = | 406 lbs | |
| | $V_c$ = | 2,103 lbs (ACI 22-9) | |
| | $D_{req}$ = | 1.2 in | |
| | $D_{footing}$ = | **6.0** in | ⟶ **OK** |

Bending Calculations:

| | | |
|---|---|---|
| | a = | 0.26 in |
| Cantilever length | $L_{cant}$ = | 3.0 in |
| Factored Bending Moment | $M_u$ = | 609 in-lb |
| Moment Strength | $M_n$ = | 14,997 in-lb |

Bending Calculations:
Unreinforced Concrete

| | | |
|---|---|---|
| | S = | 32.0 $in^3$ |
| | $M_u$ = | 609 in-lb |
| | $M_n$ = | 5,258 in-lb (ACI 22-2) |
| | $D_{req}$ = | 0.7 in |
| | $D_{footing}$ = | **6.0** in ⟶ **OK** |

Transverse Reinforcement Calculations:

| | | |
|---|---|---|
| $M_u/\phi bd^2$ | $R_n$ = | 11.1 psi |
| Steel Ratio | $\rho$ = | 0.0002 |
| Steel Req. based on Moment | $A_s(1)$ = | 0.005 $in^2$ |
| Steel Req. based on Shrink | $A_s(2)$ = | 0.130 $in^2$ (ACI 7.12) |
| Controlling Reinf. Steel | $A_s(req)$ = | 0.130 $in^2$ |
| Required Spacing with #4 bars = | | 18.18 in o/c |
| Selected Transverse Spacing: | **#4 bars @** | **18** in o/c |
| Reinforcement Area Provided | $A_s$ = | 0.131 $in^2$ ⟶ **OK** |

Eff. Depth to Top Layer of Steel
d =        2.25 in

**(Transverse Reinforcment Unnecessary)**

Development Length Calculations:        Note: Plain concrete adequate for bending, therefore development length not required.

| | | |
|---|---|---|
| spacing/cover dimension | c = | 3.0 in |
| Transverse Reinf. Factor | $c + K_{tr}/d_b$ = | 6 (use 2.5) |
| Length Req. | $L_d$ = | 13.0 in (ACI 12-1) |
| Length Available | $L_{d-sup}$ = | 0 in |

| | | |
|---|---|---|
| $\lambda$ = | 1.0 | (lightweight aggregate factor) |
| $\Psi_t$ = | 1.0 | (reinforcement location factor) |
| $\Psi_e$ = | 1.0 | (coating factor) |
| $\Psi_s$ = | 0.8 | (reinforcement size factor) |
| $K_{tr}$ = | 0.0 | (transverse reinf. Index) |

Longitudinal Reinforcement Calculations:

| | | |
|---|---|---|
| Steel Req. based on Shrink | $A_s(2)$ = | 0.130 $in^2$ (ACI 7.12) |
| Controlling Reinf. Steel | $A_s(req)$ = | 0.130 $in^2$ |
| Required number of #4 bars = | | 0.66 |
| Selected Longitudinal Bars: | | **2 - Cont. #4 bars** |
| Reinforcement Area Provided | $A_s$ = | 0.393 $in^2$ ⟶ **OK** |

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