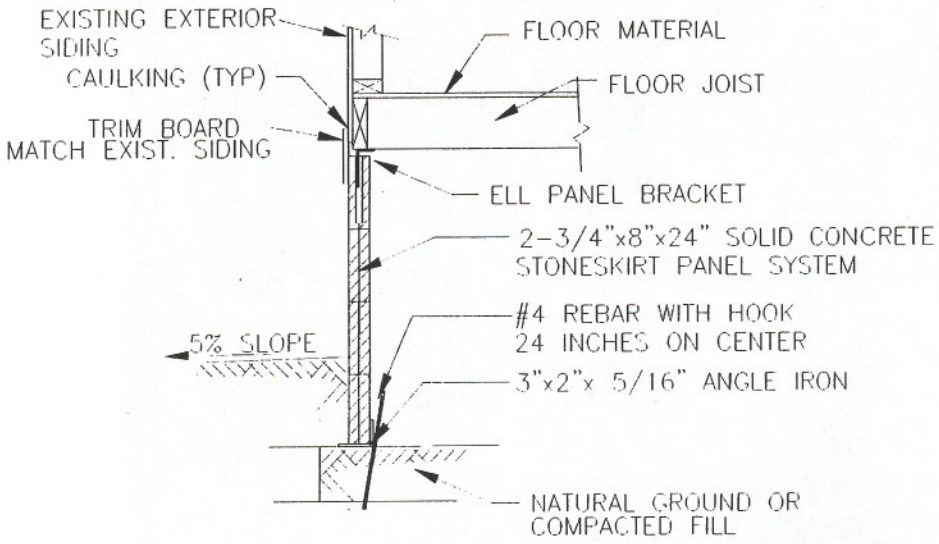
Manufactured Housing
Solid Concrete Block Retaining Wall Design Calculations
Angle Iron Bottom Support



PERIMETER SIDEWALL DETAIL

Use Coulomb's general equation for active earth load on a retaining wall:

$$P = \tfrac{1}{2}\, wH^2 \frac{1-\sin\phi}{1+\sin\phi}$$

Where:

P = total pressure per linear foot of wall in lbs.
w = specific (unit) weight of soil in lbs. per cu. Ft.
H = height of wall in ft.
ϕ = angle of internal friction of the soil

Soils = Fine Silty Sands to Silty Sands to Sandy Loams
w = 110 pcf
ϕ = 35° increases with compression

Maximum depth of fill on the wall is 12 inches. Add a two-foot surcharge for this design; this is approximately equivalent to a heavy backhoe tractor that might be expected to operate close to the top of the wall during construction operations.

$$P = \tfrac{1}{2}\,(110\text{ pcf})(3.0')^2\left(\frac{1-\sin 35^\circ}{1+\sin 35^\circ}\right)$$

P = 134.15 lbs. acting 4.0" above the base

Compute Equivalent Fluid Pressure

$\frac{1}{2}wH^2$ = 134.14 lbs.

$w = 134.14 \times 2 / (3.0')^2 = 29.8$ psf

The top of the wall is attached by the ell bracket to the manufactured home. Calculate the reactions R_1 and R_2 at the top and bottom of the wall by calculating moments about R_1.

$R_2(32") = P(28.0")$ therefore $R_2 = 117.37$ lbs.

$R_1 = P - R_2 = 16.78$ lbs.

Check Maximum length of angle between support points (vertical rebar).

Angle Iron Properties:
Weight = 1.79 lb./ft.
Area = 1.47 sq. in.
I = moment of inertia = 1.29 $in.^4$
S = section of modulus = 0.65 $in.^3$
Tensile Strength = 18,000
E = modulus of elasticity = 28,600,000

Calculate Resisting Moment of Angle (M_r)

$S = I/c$
$c = 1.29/0.65 = 1.98$
$M_r = x\ I/c = (18,000)(1.29)/1.98 = 11,727$ in-lb

Solve for Maximum Length (l) in Bending Moment Formula

$W = 117.37$ lb./ft = 9.78 lb./in.
$M = w\ l^2 / 8$
$l = ((11,727)(8)/9.78)^{.5} = 98$ inches
Set vertical rebar at 24 inches on center,
Safety Factor = 98"/24" = 4.08

Resistive force of the rebar in the ground will be the limiting factor to determine the distance between rebar. Weight supported by each rebar that is driven into the ground at 24" on center (o.c.).

Wt = (24")(9.78 lb/in) = 234.72 lb.
Mo = (2")(234.72) = 469.44 in-lb
Mr = (.94 lb.)(2")(2/3) + (59 lb.)(10")(1/2) = 296.25 lb.
Resistive Force of rebar in ground is OK for 24" spacing.