Appendix G – Shoring Calculations

*** Earth Pressure for Common Conditions of Loading:**

Assumptions:

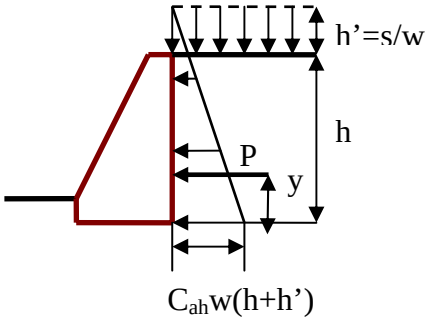
- Backfill material is considered "silty sands, poorly graded sand-silt mixes"
- As stated in the Subsurface Exploration and Geotechnical Engineering Analysis, the active soil pressure is 45 lbs/sf of depth and the at-rest soil pressure is 60 lbs/sf of depth
- Backfill height will be for the worst case scenario of 9'
- Soil surcharge (s) from the backhoe and roller drum will be 115 lb/ft^2
- Unit weight (w) of the soil is 110 pcf
- PAmax for Ulma posts = 8,500 lbs

$h' = s/w$

$y = \frac{h^2 + 3hh'}{3(h + 2h')}$

$P = 1/2 C_{ah} wh(h+2h')$

Figure 15. Earth Pressure
(horizontal surface with surcharge)



Finding the soil force per horizontal foot –

$C_{ah}wh$ = 60 x height

y = h/3 = 9 ft / 3 = 3 ft

P = ½ x 60 x $(9ft)^2$ = 2,430 lb/horizontal foot

h' = 1.05 ft

y = [$(9ft)^2$ + 3 x 9ft x 1.05ft] / [3 x (9ft x 2 x 1.05ft)] = 3.28 ft

P = ½ x 60 x 9ft (9 ft x 2 x 1.05 ft) = 2,997 lbs/horizontal foot

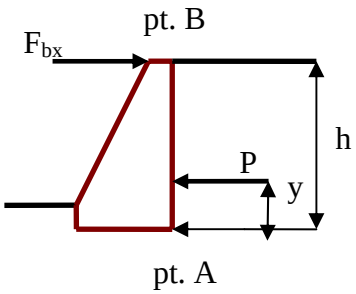
Finding the axial load in the shoring –

h = 9'

y = 3.28 '

P = 2,997 lbs

Figure 16. Free Body Diagram



Sum of Moments about pt. A =

2,997 lbs (3.28') – F_{bx} (9') = 0

F_{bx} = 1093 lbs

To find the axial load in the Ulma post –

$(1093^2 + 1093^2)$ ^ ½ = 1546 lbs

Assuming each post has a max PA of 8,500 lbs, shores have to be spaced between 5 and 6 feet on-center along the face of the walls.

***Nilson 2004**