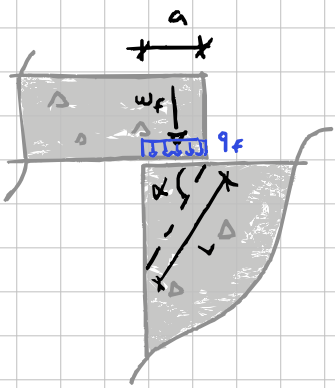
04- Bearing of concrete corners.

Suppose a factored load w_f applied to a unReintorced concrete corner.



The failure plane will be of length L along an unknown angle α

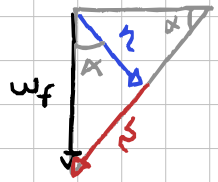
From CSA A23.3-19 Clause 11.5 Interface shear transfer:

$\tau_R = \Phi_c (c + \mu \sigma)$, with $c = 1.0\,MPa$ and $\mu = 1.4$ for concrete placed monolithically.

Decomposing the applied load into linear loads, then pressures.

Linear (kN/m)		Pressure (MPa)	
$N_f = w_f \sin\alpha$	}	$\tau_f = N_f / L$	$= q_f \sin\alpha \cos\alpha$
$n_f = w_f \cos\alpha$		$\sigma_f = n_f / L$	$= q_f \cos^2\alpha$
$L = a / \cos\alpha$		where $q_f = w_f / a$	

$$\tau_R = \Phi_c (1.0\,MPa + w_f \cos^2\alpha / a \cdot 1.4)$$



$$\text{Utility} = \frac{\tau_f}{\tau_R} = \frac{q_f \sin\alpha \cos\alpha}{\Phi_c (1.0\,MPa + 1.4\, q_f \cos^2\alpha)}$$

Solving for Utility = 1.0 by Trial and Error, we get $q_R = 2.94\,MPa$ with a critical angle of $\alpha_c = 66.2°$. Interestingly, independent of a and f'c.

This governs over standard bearing ($0.85 \cdot 0.65 \cdot f'c$) for concrete with $f'c > 5\,MPa$.