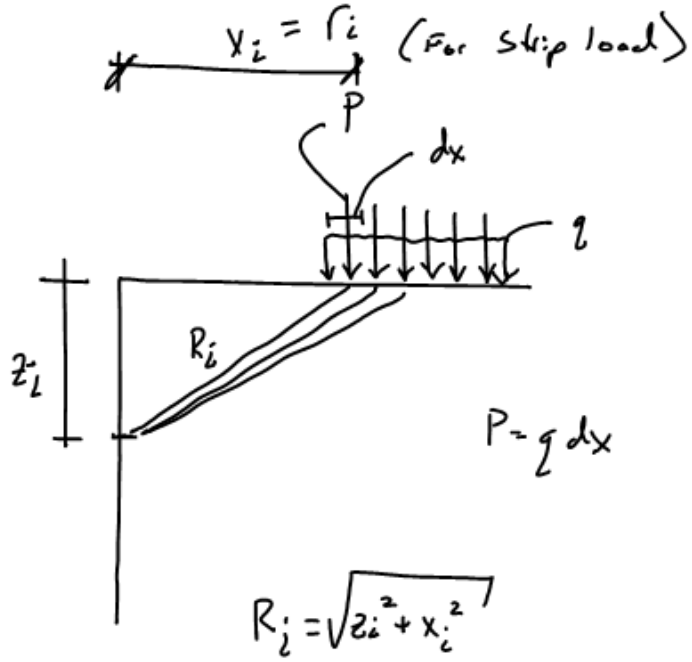
HOW TO ENGINEER	Project: Elastic Methods				Job Ref.	
	Section: Spangler Derives Integrated Method				Sheet no./rev.: 1	
	Calc. by: RSF	Date: 11/17/2012	Chk'd by	Date	App'd by	Date

SPANGLER DERIVES INTEGRATED METHOD - BOUSSINESQ NOTES



$$\sigma_x = \sigma_r = -\frac{P}{2\pi R^2}\left[\frac{-3r^2 z}{R^3} + \frac{(1-2\nu)R}{R+z}\right]$$

$(r_i = x_i)$

$$= \frac{P}{2\pi}\left[\frac{3r^2 z}{R^5} - \frac{1-2\nu}{R(R+z)}\right]$$

$$= \frac{P}{2\pi z^2}\left[3\sin^2\theta\cos^3\theta - \frac{(1-2\nu)\cos^2\theta}{1+\cos\theta}\right]$$

(See Bowles 3rd Ed.)

"Boussinesq Integrated"

Spangler shows $\Rightarrow$ $\sigma_h = P\frac{x^2 z}{R^5}$ (r) EQ 1

This due to tests showing 2x Bous. w/ $\nu = 0.5$

or

$\left\{2 \times \frac{3P}{2\pi}\right\}\frac{x^2 z}{R^5} \Rightarrow \frac{P x^2 z}{R^5}$

$\sum_{-\infty}^{\infty} IP$

Spangler integrates EQ 1 and Finds an Strip load Eqn =

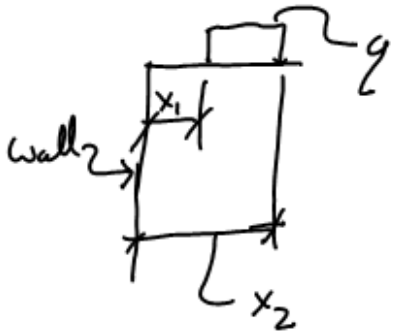
EQ 2

$$\sigma_H = \frac{2q}{\pi}\left[\tan^{-1}\left(\frac{x}{z}\right) - \frac{xz}{(x^2+z^2)}\right]_{x_1}^{x_2}$$

x_2 = Far edge of strip load

x_1 = Near edge of strip load

↑ evaluate From $x_2 - x_1$



using $1/2 \times$ EQ2 (Spangler Strip Eqn)
Yields the same result as found
in Poulos & Davis Along w/ many other
Texts

$$\sigma_H = \frac{q}{\pi} \times \left[\theta - \sin\theta \cos(\theta + 2\alpha)\right]$$

or

$$\delta_H = \frac{q}{\pi} \times \left[\theta - \sin\theta \cos 2\beta\right]$$