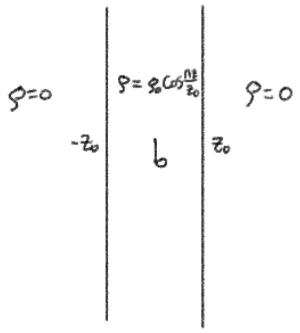
$\rho = \rho_0 \cos\frac{\pi z}{z_0}$



$\nabla^2 \Phi = 0 \quad z \geq z_0 \quad \frac{\partial^2 \Phi}{\partial z^2} = 0 \quad C + \frac{\partial \Phi}{\partial z} \quad zC + D = \Phi$

$\nabla^2 \Phi = 0 \quad z \leq -z_0 \quad \frac{\partial^2 \Phi}{\partial z^2} = 0 \quad zC' + D' = \Phi$

$\nabla^2 \Phi = \frac{\rho}{\varepsilon_0} \quad |z| < z_0 \quad -\frac{\partial^2 \Phi}{\partial z^2} = \frac{\rho}{\varepsilon_0} \quad -\frac{\rho_0 \cos\frac{\pi z}{z_0}}{\varepsilon_0} = \frac{\partial^2 \Phi}{\partial z^2}$

$-\frac{\frac{z_0}{\pi}\rho_0 \sin\frac{\pi z}{z_0}}{\varepsilon_0} = \frac{\partial \Phi}{\partial z}$

$+\frac{z_0^2 \rho_0 \cos(\frac{\pi z}{z_0})}{\pi^2 \varepsilon_0} + z0J + 0k = \Phi$

Because infinate Charge distb $\Phi(z=\infty) \neq 0$

BC:S

Set $\Phi(z=0) = 0$

$\Phi_{-1} = \Phi_0 \quad E_{-1} = E_0$

$\Phi_0 = \Phi_1 \quad E_0 = E_1$

I have 5 BC's and 6 unknowns

$+\frac{z_0^2 \rho_0 \cos(\frac{\pi z}{z_0})}{\pi^2 \varepsilon_0} + z0J + 0k = \Phi$

$\Phi(z=0) = 0 \quad \frac{z_0^2 \rho_0}{\pi^2 \varepsilon_0} + 0 + 0k = 0$

$0k = -\frac{z_0^2 \rho_0}{\pi}$

$\frac{z_0^2 \rho_0}{\pi^2 \varepsilon_0} \cos(\frac{\pi z}{z_0}) + z0J - \frac{z_0^2 \rho_0}{\pi} = \Phi_0$

I understand that we can choose our potential refrence point if at ∞ potential $\neq 0$

In the Solution they Set $E(z=0) = 0$ I don't understand where this boundary condition came from

Is E field like potential? Can we choose a refrence point?