Using (13) and (15), the axial stress σ_z becomes

$$\sigma_z = \sigma_r - \frac{2\bar{\sigma}}{3\bar{\epsilon}} (2\epsilon_r + \epsilon_\theta) \qquad (19)$$

These last three equations can be combined with the two equilibruim equations, (11) and (12), to give

$$\frac{\partial \sigma_r}{\partial r} + \frac{2\bar{\sigma}}{3r\bar{\epsilon}} (\epsilon_r - \epsilon_\theta)$$

$$+ \frac{1}{3} \frac{\partial}{\partial z} \left(\frac{\bar{\sigma}}{\bar{\epsilon}} \gamma_{rz} \right) = 0 \qquad (20)$$

$$\frac{1}{3} \frac{\partial}{\partial r} \left(\frac{\bar{\sigma}}{\bar{\epsilon}} \gamma_{rz} \right) + \frac{\partial \sigma_r}{\partial z} + \frac{\bar{\sigma}}{3r\bar{\epsilon}} \gamma_{rz}$$

$$- \frac{2}{3} \frac{\partial}{\partial z} \left[\frac{\bar{\sigma}}{\bar{\epsilon}} (2\epsilon_r - \epsilon_\theta) \right] = 0 \qquad (21)$$