$$\gamma_{rz} = \frac{\partial u}{\partial z} + \frac{\partial w}{\partial r} \tag{2}$$

where u and w are the radial and axial displacement, respectively, and γ_{rz} is the shearing strain. If the displacements u and w are defined in terms of displacement function as

$$u = \frac{1}{r}\frac{\partial \psi}{\partial z}, \qquad w = -\frac{1}{r}\frac{\partial \psi}{\partial r} \tag{3}$$

then the volume constancy equation is satisfied identically.

Using the assumptions of small finite strains (less than 20-30 percent) and the condition that the principal axes of stress and strain for a particle do not rotate with respect to the particle during the process of straining , Reference (k), the strains and strain increments may be written with the proportionality relationship as

$$\frac{d\epsilon_r}{\epsilon_r} = \frac{d\epsilon_\theta}{\epsilon_\theta} = \frac{d\epsilon_z}{\epsilon_z} = \frac{d\bar{\epsilon}}{\bar{\epsilon}} \tag{4}$$

This condition is achieved if there is no shear on any of the wafer surfaces, and the wafer maintains its cylindrical shape during loading. The same is approximately true for small amounts of shear at the wafer-anvil interfaces. A further discussion of this restriction is presented in the section Experimental Procedures and Results, and is supported in