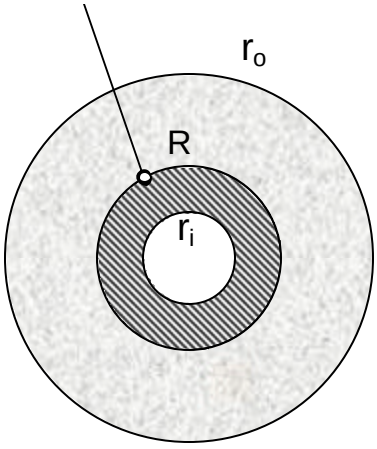
Press & Shrink Fits

1) Select amount of interference.
   - See tables (ANSI/ASME) for class FN1 (light) to FN5 (Heavy-drive) fits.
   - They give interference in 0.001" on diameter for a range of diameters
   - Ex: FN4 for 0.95 to 1.19" diameter, interference = 1 to 2.3 mils on diameter.

2) Compute the pressure at the mating surface.
   - If same materials, use Eqn. 10.52

Where δ_r is RADIAL interference.



$$p = \frac{Ed_r}{R}\left[\frac{\left(r_o^2 - R^2\right)\left(R^2 - r_i^2\right)}{2R^2\left(r_o^2 - r_i^2\right)}\right]$$

and if shaft is solid ($r_i = 0$): $$p = \frac{Ed_r}{2R}\left[1 - \frac{R^2}{r_o^2}\right]$$

   - If different materials, use Eqn. 10.51 (flipped)

$$p = \frac{d_r}{\frac{R}{E_o}\left(\frac{r_o^2 + R^2}{r_o^2 - R^2} + \nu_o\right) + \frac{R}{E_i}\left(\frac{R^2 + r_i^2}{R^2 - r_i^2} - \nu_i\right)}$$

(ν *is Poisson's ratio*)

3) Compute the tensile hoop stress in the outer piece. Eqn. 10.45

$$s_{o_t} = p\,\frac{r_o^2 + R^2}{r_o^2 - R^2}$$

4) Compute compressive tangential (hoop) stresses in the inner piece. Eqn. 10.49

$$s_{i_t} = -\,p\,\frac{R^2 + r_i^2}{R^2 - r_i^2}$$

5) Compute the increase in Inner Radius of the outer member from the hoop stress. Eqn. 10.46

$$d_o = \frac{pR}{E_o}\left(\frac{r_o^2 + R^2}{r_o^2 - R^2} + \nu_o\right)$$

6) Compute the decrease in Outer Radius of the inner member from the tangential compression. Eqn. 10.50

$$d_i = -\frac{pR}{E_i}\left(\frac{R^2 + r_i^2}{R^2 - r_i^2} - \nu_i\right)$$

7) As a check, ensure that:

$$|d_i| + |d_o| = d_r$$