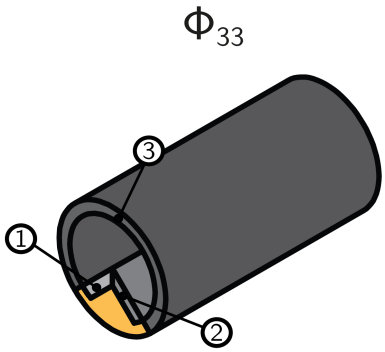
View Factor 29

A long three-quarter circular body is connected to two flat plates perpendicular to each other. Determine the view factor Φ_{33}:



A flat plate can never see itself and therefore:

$$\Phi_{11} = \Phi_{12} = 0$$

Surfaces 1 and 2 cannot see each other and therefore:

$$\Phi_{12} = \Phi_{21} = 0$$

Combining this with the summation rule ($\Phi_{11} + \Phi_{12} + \Phi_{13} = 1$) one finds that:

$$\Phi_{13} = 1$$

Using the reciprocity rule ($A_1\Phi_{13}A_3\Phi_{31}$) one will find:

$$\Phi_{31} = \Phi_{13}\frac{A_1}{A_3} = \frac{\frac{1}{2}DL}{\frac{3}{4}\pi DL} = \frac{2}{3\pi}$$

From symmetry one can see that $\Phi_{31} = \Phi_{32}$, combining this with the summation rule ($\Phi_{31} + \Phi_{32} + \Phi_{33} = 1$) yields:

$$\Phi_{33} = 1 - 2\Phi_{31} = 1 - \frac{4}{3\pi}$$