zones of different focal lengths in order to smooth the flux profile. The secondary provides additional smoothing while providing 3X concentration. Generally, such secondaries are made with reflective aluminum sheet.

Dielectric-filled CPCs have also been used as secondary optical elements. In one case a concentration of 1000X was achieved on GaAs cells with an acceptance angle of $\pm 0.8^\circ$ [55].

As mentioned above, CPCs can have a rather nonuniform output. There is another type of secondary that gives almost uniform illumination intensity. The basic idea is to image the primary lens onto the cell [56]. Thus, if light strikes the primary uniformly, the illumination on the cell will be uniform. The principle is illustrated in Figure 11.32. The top surface of the secondary is an aspheric surface that images the lens on the cell. The definition of this surface can be found by using the same methodology as for the plano-convex lens mentioned above. In practice, however, it is usual to use ray tracing to optimize the shape of the lens in order to minimize the effect of edge ray distortion.

It is seen that the center of the primary lens is imaged on the center of the cell and the edge is imaged on the edge of the cell. If the lens is uniformly bright, then so will be the cell illumination. Some understanding of the operation of a silo secondary can be

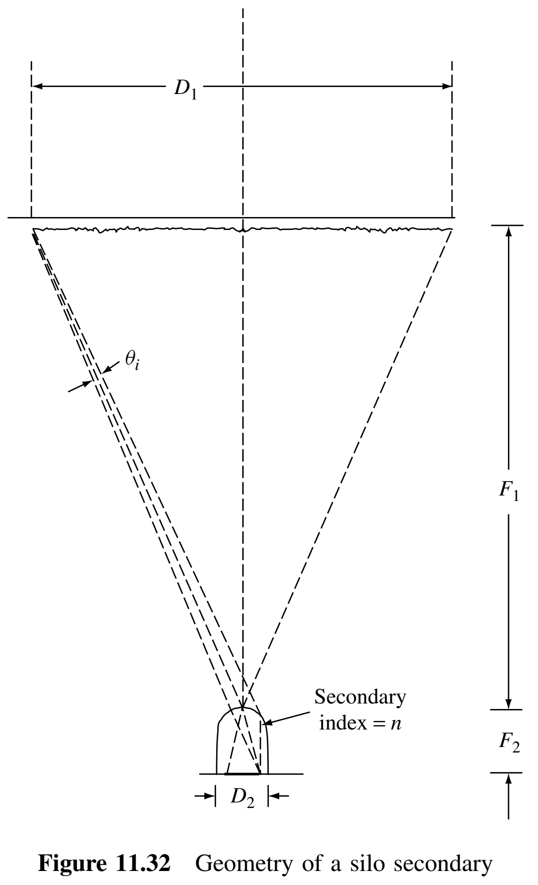

Figure 11.32 Geometry of a silo secondary