The inner radius of the bore tube should flare in proportion to the inverse square root of the magnetic field. A field ratio of 20/1.5 implies a radius ratio of 3.65; if the radius is 7.5 cm when $B = 20$ T, then the radius should be 27.4 cm when $B = 1.5$ T. The bore tube plotted in Fig. 1 flares from 8 cm at $z = 0$ to 28 cm at $z = 15$ m, to provide a radial clearance of 0.5 cm at $z = 0$ and 0.6 cm at $z = 15$ m.

**Elliptically-Flaring Bore Tube**: I.R. = 8 cm at 0, 28 cm at 15 m; O.R. = 10 cm at 0, 30 cm at 15 m

**Fig. 2**: Bore tube whose I.R. flares elliptically from $r_{1,0} = 8$ cm at $z = 0$ to $r_{1,15} = 28$ cm at 15 m, and whose O.R. flares from $r_{2,0} = 10$ cm at zero to $r_{2,15} = 30$ cm at 15 m. At $z = 2.95$ m the I.R. = 17.87 cm, and the O.R. = 19.59 cm.
Vessel (bore tube, flanges & cylindrical shell) are of steel; specific gravity $\gamma = 7.85$; $E = 200$ GPa. Shielding, of $\gamma = 10$ (61% WC of $\gamma = 15.8 + 39\%$ H$_2$O), exerts pressure proportional to depth. Thickness of annular disks =5 cm; thickness of cylindrical shells = 2 cm.

Fig. 2: Cross section of resistive magnet, upstream three coils of superconducting magnet, and vessel of design “Lay2e7at11MW.xlsx”. Cylindrical shells are 2-cm thick; annular disks are 5-cm thick. Bore tube is of constant inner radius of 8 cm from $z = -2.42$ m to zero, flaring elliptically thereafter to 17.87 cm at $z = 2.95$ m.