Constant Directivity Horns:

A horn provides more sound pressure level (SPL) at a given listening area by increasing the directivity of the sound towards the listener. There is more sound at the listening area, and less sound outside of that area. By analogy, think of focusing a beam of light (*e.g.* from a flashlight). A widely focused beam spreads the light around, thus the intensity at any given point is reduced. However, a narrowly focused beam provides much more light intensity at the center, and much less in the surrounding area. Properly designed horns can also act as a waveguide that actually serves to spread higher frequency sounds out in a much more consistent manner than would otherwise happen. Round horns and radial horns tend to change their angles of spread {their directivity, measured by the directivity factor, $Q(f)$} as the frequency f changes. This means that high frequencies might be more highly directed and therefore sound louder to someone in a central location than to someone else outside of the center (but still within the horn's low-frequency area of enhancement). To cope with this problem, the constant directivity (*CD*) horn was invented.

The design goal of the *CD* horn was to provide the same *SPL* at all frequencies within the designed coverage angles. The term "Constant Directivity" is actually trademark of ElectroVoice but has become somewhat of a catch-all phrase to describe constant-beamwidth horns.

In 1975, Electro-Voice introduced a single-cell horn that consisted of three-stages. The design incorporates a hybridized hyperbolic/exponential throat section coupled to a conical, vertically flared, radial bell section. Flanges that correct for midrange beaming caused by edge diffraction are comprised of a second, wider conical, vertically flared, radial bell-section. As with classic radial horn designs, the sidewalls are straight, but in two flange sections. Having constant beamwidth in both the vertical and horizontal directions, and an unprecedented high directivity index, these horns became the model for virtually all-new horn designs for the next decade. Additionally, they horn loaded the driver well, and as a result sounded very good. The specifications, directivity factor and beamwidth vs. frequency for the *EV HP*640 constant directivity horn {used primarily in home theater sound systems}, are shown in the figures below: