The Aesthetic Role of Depth of Field in Anamorphic Cinematography

Concerning depth of field and focal lengths—which relate to the shape and the area of the bokeh

by Jon Maxwell

An important feature of anamorphic cinematography is the look of the images compared with normal spherical lenses, whether it be distortion, or colored streaks, or bokeh. But distortion, streaks and bokeh are not the only contributors to the difference between the look of a spherical lens and an anamorphic lens; depth of field also plays an interestingly subtle part in this difference of look.

In this article, I am referring to the new set of Cooke anamorphic lenses, which have cylindrical elements at the front of the lens.

For any point in the picture, the depth of field for vertical image structure is different from the depth of field for the horizontal image structure, and the lens will generate vertical elliptical bokeh.

Consider a scene shot on a ranch: the cross-bars on the gates are mostly horizontal, and the posts of the fences are mostly vertical. The depth of field for the gates will be less than the depth of field for the fences. You can guess that this must be the case when you look at the interesting and attractive elliptical bokeh that an anamorphic lens creates: The bokeh of front anamorphic lenses are elliptical because of the placement of the cylindrical elements. Furthermore, the focal length of the anamorphic lens is different in the horizontal plane compared with the vertical plane, and, the circle of confusion used to calculate the depth of field is also elliptical.

For example, a 100 mm anamorphic 2x squeeze lens has a focal length of a 100 mm in the vertical plane and a focal length of 50 mm in the horizontal plane. So, the ratio of the two focal lengths is 2x (100/50 = 2). However, the difference of the two depth of fields is 4x. Why is that?

Pull out your ASC Manual or the lens manufacturer's depth of field charts—or dust off your Guild Kelly or Samcine calculator or click on your pCam or Toland app.

You will see that for spherical lenses having a 2x difference in focal length, like our 100 mm Anamorphic lens, with its 50 mm focal length in the horizontal plane (both set at the same T/stop and focus distance), you will see approximately a 4x difference in depth of field. In other words, if the depth of field for the 100 mm is 2 inches, it will be 8 inches for the 50mm lens.

If you don't have depth of field charts for your anamorphic lenses, you will be safe to look up published depth of field data for the vertical focal length "component" of your anamorphic lens (that is 100 mm in our example), and similarly for the horizontal focal length (50 mm). But If you are in a real rush, and you are concerned to have "at least enough" depth of field you can just depend on the 100 mm focal length value, which is the lesser of the two depths of field. However, as we were going to some lengths to explain, this slightly mysterious dual nature of the depth of field is an important part of the anamorphic look. I mean, when the cowboy hero rides into the ranch yard, nobody is going to calculate the exact effects, but the anamorphic depth of field look is going to be there telling the story.

A more mathematical way to think of this is to compare the beam diameter in object space for a 100 mm spherical lens compared to a 50 mm spherical lens at the same T-stop. You'll find there is a 2x difference in beam diameters, but a 4x difference in beam area (area of a circle is πr^2).

Earlier, I mentioned the out of focus highlights (bokeh). In addition to those, the overall anamorphic look of the picture is created not only by the in-focus highlights but also by any objects in the picture. The large 4x difference in depth of field actually contributes substantially towards the overall look of the image, whether there is actual bokeh in any particular shot. This is something that cannot be reproduced with spherical optics shooting Super 35 flat or, for that matter, with the post-processing of captured images.

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Below: Framegrab from "Seeing." Cooke Anamorphic 40mm at T2.3 on ARRI Alexa. Directed by Francis Luta. Cinematography by Jeremy Benning, CSC and Adam Marsden, CSC.