

About Lighting

The f-stop and TV Studio Lighting

By Mike Wood

More correctly called the f-number the f-stop (or stop) of a lens is proportional to the ratio of the focal length of the lens to its aperture (or iris) and gives a measure of the light transmitted by the lens.

As the area of the iris (and thus the light transmitted) is proportional to the square of its diameter increasing the aperture by a factor of 1.4 (square root of 2) will double the light. This explains the sequence 1, 1.4, 2, 2.8, 4, 5.6, 8, 11, 16 you will be familiar with on a camera's iris. So one 'stop' open on an iris represents a doubling of the transmitted light.

Why is this relevant to lighting? Surely a cameraman would always like as much light as he can get - well, not always - 'stopping' down the lens has another effect as well as reducing the light, it also increases the depth of focus (field) of the lens. The smaller the iris the greater range of far and near objects will be in focus.

Say you are lighting a drama for television and you want the performers to stand-out from the background. One way of doing this is to make sure that the actors are in focus and the background is fuzzy and out of focus. Opening up the lens iris will do this, but you then need to reduce the lighting levels to avoid 'over-exposing' the picture and making it look all washed out.

At the other extreme, say you are lighting a large light entertainment number with hundreds of dancers all moving rapidly at different distances from the camera. You want them all to be in focus all of the time. Solution - lots of light so you can stop down the iris as far as possible to give maximum depth of field.

Another facet of this relates to lighting desks, dimmers and lamp color temperature. Incandescent lamps change color temperature as they are dimmed. The more they are dimmed the redder they get. This change can be noticeable "on camera" if it is too great, so normally the cameras are set up not with the lamps at full power but with them set somewhere in the middle.

Typically a TV studio will line up the cameras to a color temperature of 2950K. This is achieved by dimming the light to half output. The lighting director then has the ability to raise or lower the level of any light either up or down by one stop (double or half light output) without objectionably changing the color temperature of the light.