Significance of spatial frequencies

The spatial frequency used to evaluate lens performance is directly related to the resolution needed for the final image as viewed. For example, in an 8″×10″ image, at normal viewing distances, the eye can resolve, at best, 4 to 5 Lp/mm. If a 16″×20″ image is viewed at its normal viewing distance (which is greater than the viewing distance for 8″×10″) approximately 2 to 2½ Lp/mm will make the image appear as sharp as an 8″×10″ which has 4 to 5 Lp/mm. Carrying this even further, a 30″×40″ print with 1 to 1¼ Lp/mm, viewed at its normal viewing distance, would appear as sharp as the 8″×10″ with 4 to 5 Lp/mm.

Therefore, these resolutions when referred back to 4″×5″ film result in a required resolution of 8 to 10 Lp/mm to reach the limits of normal human vision under ideal conditions. Generally, 5 Lp/mm is visually adequate for most applications. Note that with the 35 mm film format, between 20 to 40 Lp/mm would be required on the film to achieve the same apparent sharpness.

It's important to also realize that most films show contrast loss at 20 Lp/mm; therefore, the difficulties of using smaller format film become even more apparent. Thus, the MTF curves at 5 to 10 Lp/mm are the most important ones as these are the frequencies that are most frequently utilized. A loss in the contrast at these spatial frequencies would result in lower image quality.