Eastman Ektachrome 7251

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A new high-speed, color reversal, 16-mm camera film, compatible with either Process VNF-1 or Process RVNP, is now available. The film, Eastman Ektachrome* High Speed Daylight Film 7251, has been developed to help further satisfy the need of cinematographers working in disciplines such as sports and motion analysis for more photographic speed. It is designed for daylight exposure and will produce acceptable results under a variety of metal halide and xenon arc discharge lamps without filtration.

Eastman Kodak Company has recently introduced a new 16-mm color reversal motion-picture film to help satisfy the needs of cinematographers working in sports and in motion analyses for more photographic speed.

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The new film, Eastman Ektachrome High Speed Daylight Film 7251, is balanced for daylight exposure and will produce acceptable results under a variety of xenon and metal halide discharge lamps without filtration. At its normal exposure index of 400, it provides an increase in speed of 1⅓ stops over Eastman Ektachrome Video News Film 7239 (Daylight). This allows faster frame rates, improved depth of field, longer-focal-length lenses, or less illumination of the subject matter for high-speed photography. In addition, the new film can be exposed at twice its rated index and force-processed with little loss of picture quality. Force-processing two or even three stops to an EI of 3200 is possible, but produces significant image-quality deterioration.

The new film is an addition to the currently available series of video news films and is developed in either Process VNF-1 or Process RVNP in the nor-

* Kodak, Eastman, Estar, and Ektachrome are trademarks.

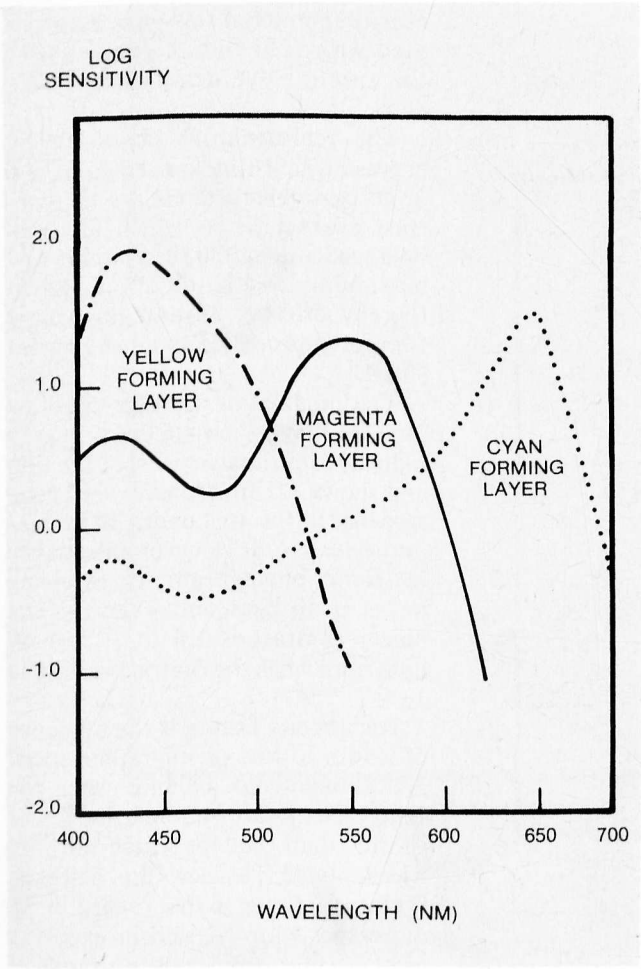

Figure 1. Spectral sensitivity curves.

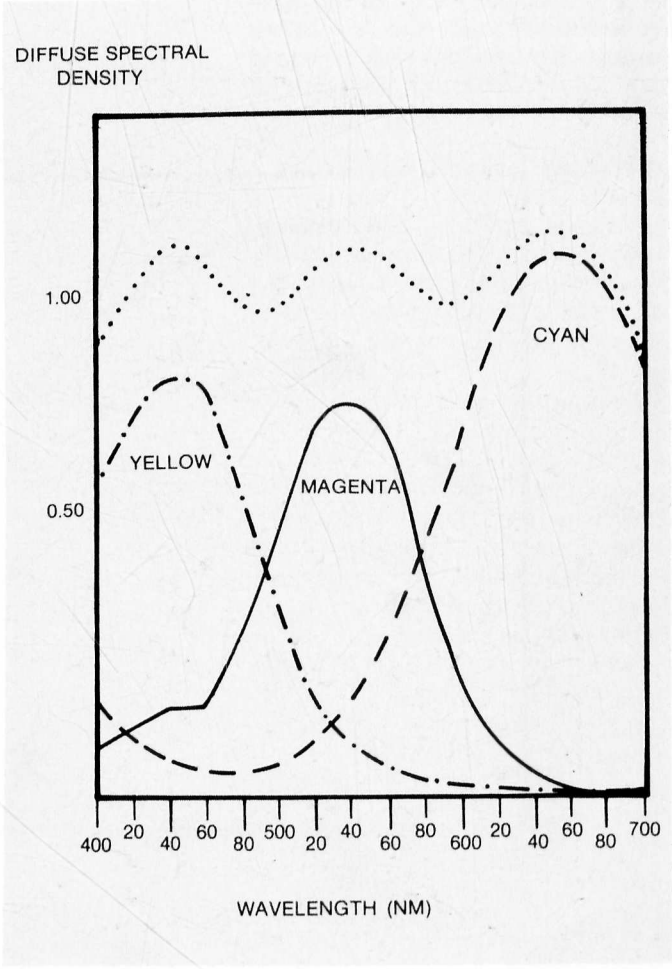

Figure 2. Spectral dye density curves.

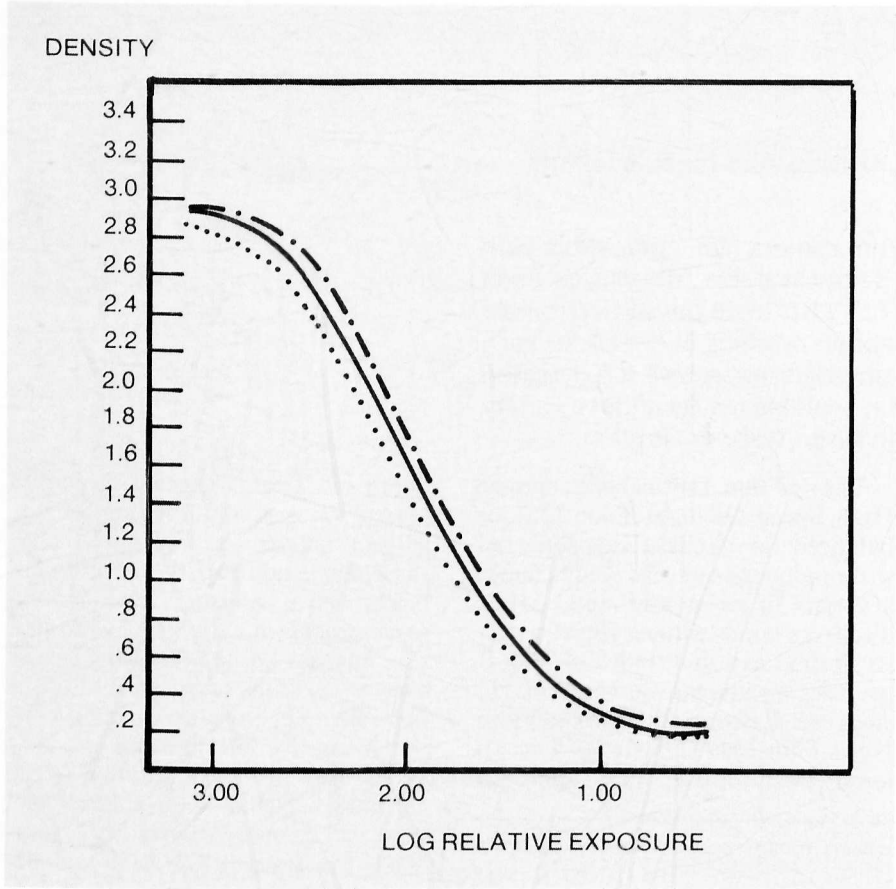

Figure 3. Representative characteristic curves of 7251 film.

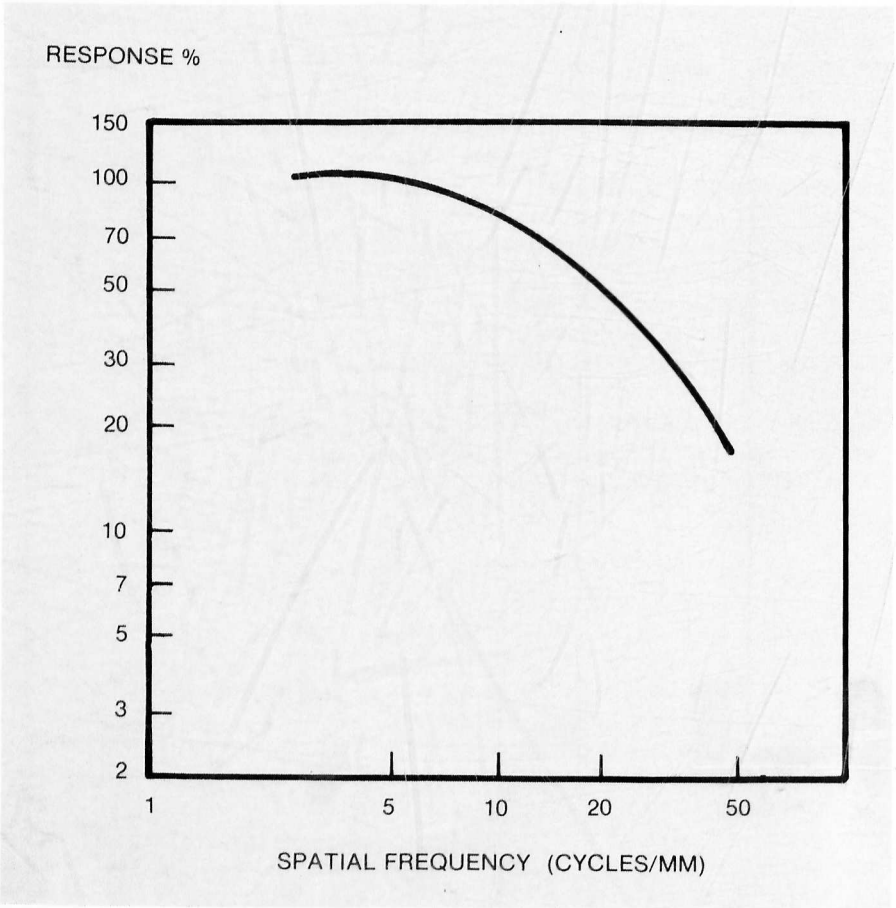

Figure 4. Modulation transfer function of the film.

mal times, temperatures, and chemicals specified for those processes. The new film is available on acetate support in 16-mm formats.

It is also available on Estar Base as Kodak Ektachrome High Speed Daylight Film SO-489 in 16-mm, 35-mm, and 70-mm formats. The spectral sensitivity curves are shown in Fig. 1. They have about the same shape as those for Eastman Ektachrome Video News Film 7239 (Daylight), but owing to the high speed, are placed differently on the ordinate.

The curves show how the film sees various illuminants and are used to derive the recommendations for color-balance correction filtration. Filtration recommendations for line sources of illumination such as metal halogen lamps cannot be given categorically. This is true for any color film, since the spectral emission of lamps varies greatly among lamp types, and also varies depending on how the lamps are ballasted.

Consequently, it is highly recommended that tests be made, where practical, for each situation. If a photographer has determined a satisfactory filter for 7239 film under a specific illuminant of this type, it can be used with 7251 film. Figure 2 shows the spectral dye density curves for 7251 film.

The representative characteristic curves of 7251 film are shown in Fig. 3. Of particular interest are the contrast characteristics which are well balanced among the three colors and maximum densities of 2.8 or higher, thereby offering advantages over a film force-processed to an equivalent speed.

The modulation transfer function for 7251 film is shown in Fig. 4. It is an indication of the sharpness of the film and shows 721 film to have very good response in the area under 20 cycles/mm, which is the range of importance in 16-mm photography. Its resolving power is 40 lines/mm when the test object contrast is 1.6 to 1, and 80 lines/mm when the contrast is 1000 to 1.

Reciprocity failure is the tendency of a film to lose photographic speed and change color balance when the time of exposure is much longer or shorter than that for which the film was designed. This new film, however, is quite forgiving in that regard. It requires no compensation in exposure level or color balance over a range of

exposure time of $^1/_{10}$-sec to $^1/_{1000}$ sec. Times of exposure outside this range require some compensation.

The granularity figure is an approximate indication of the graininess that will be perceived in the projected picture. It is 17 for this film when read at a gross diffuse visual density of 1.0 using a 48-micrometer aperture.

Table 1 — Illumination (Footcandles) Required for EI 400

Framing Rate	t 1.4	t 2.8	t 5.6	t 11
24	6	25	100	400
36	9	38	150	600
100	25	100	420	1,700
500	125	520	2,100	8,300
1,000	—	—	4,200	17,000
10,000	—	—	50,000	210,000

Technical Characteristics

The 7251 film is entirely process-compatible with either Process VNF-1 or Process RVNP. It can be spliced into a normal processing schedule of Eastman Ektachrome Video News Film 7240 (Tungsten), Eastman Ektachrome Video News Film High Speed 7250 (Tungsten), or 7239 film. The films can be run through the process one after the other without any adverse seasoning effects on the process, and all will come out at the correct speed, color balance, and contrast.

Force processing is the procedure that compensates for underexposure by increasing either the time or temperature or both of the first developer in these processes. Figure 5 shows the amount of increase needed to correct for one, two, and three stops of underexposure for any one of these four camera films.

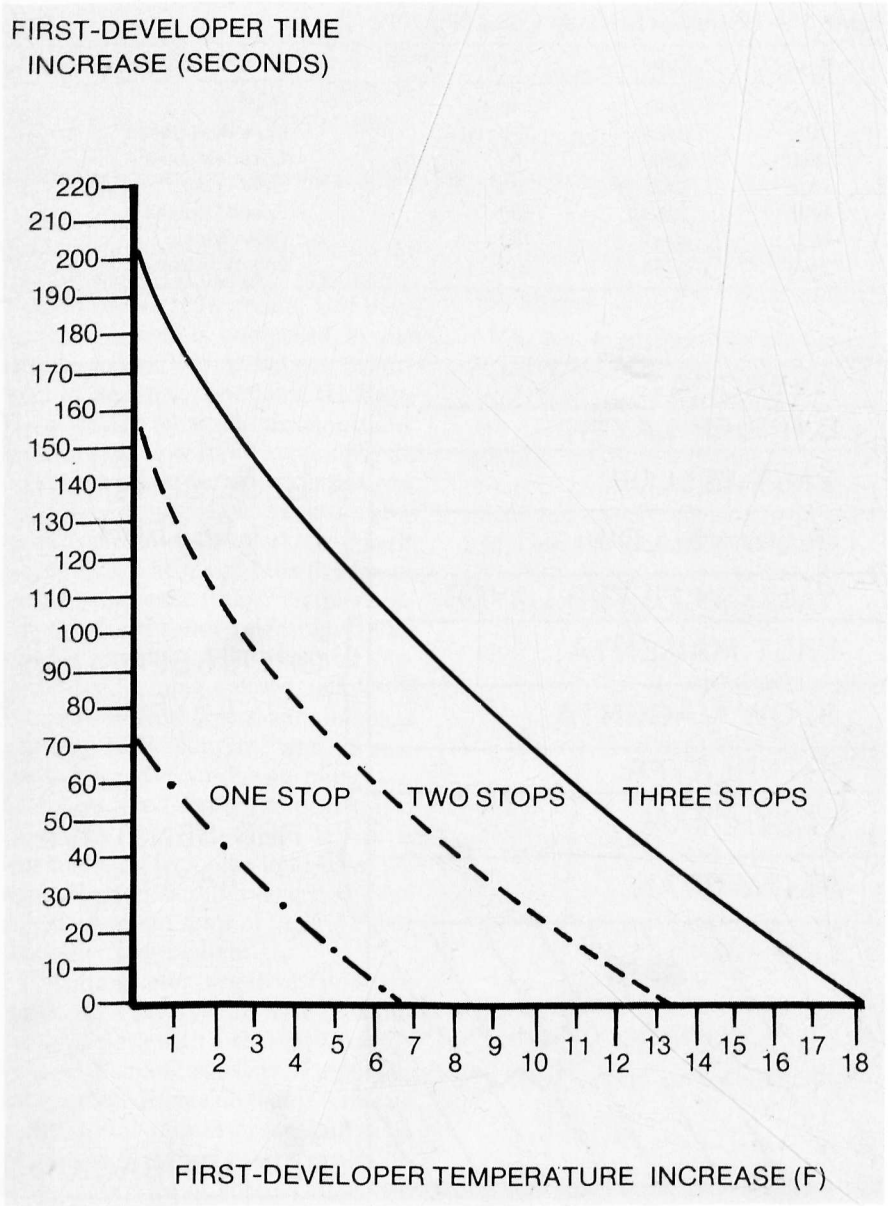

Figure 5. Force processing of the film.

It may be desirable in many instances to obtain one- and two-stop force processing by increasing the temperature or the time alone as indicated by the axes intercepts of the curves. When force-processing beyond one stop, it is advisable to use a combination of time and temperature increases to obtain the best quality at the exposure index used. Forcing three stops produces significant losses in image-quality characteristics. The most obvious are the reduction in the maximum density, an increase in graininess, and a color-balance shift in the yellow direction.

Processed 7251 film is balanced for projection at 5400 K and, therefore, produces optimum screen results when projected by an arc projector or presented over television. Projection by tungsten illumination will appear slightly warm but acceptable.

Application Data

Table 1 is a summary of aperture in *T*-stops versus required illumination for full exposure at several frame rates with the film processed at its normal 400 speed. *T*-stops are a measure of the light reaching the film plane while *f*-stop is a measure of the aperture of the lens.

The apertures given in the table are equivalent to 170 shutter opening for all frame rates except 10,000 frames/sec. At 10,000 frames/sec, an effective 140 shutter opening is used. Normal daylight in bright sun provides about 6,500 foot-candles of illumination. It can be seen from the table that adequate exposure can be achieved for track and field studies at frame rates of around 1,000 frames/sec without the need to force-process the film. Slow-motion photography is possible even in the most poorly lighted stadiums. Processed 7251 film can be printed onto Eastman Ektachrome VN Print Film 7399 when copies are needed for analysis in remote or multiple locations, or when it is desirable to alter color balance and/or density.