

A New Low-Speed Black-and-White Camera Negative Film

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WITH THE introduction of new motion-picture negative films having more and more inherent speed, the cameraman is faced with the need for artificially reducing the exposure of the film by the use of a neutral-density filter over the camera lens or by a reduction in the lens aperture when illumination levels are high, as in normal daylight. The neutral-density technique, although practical, is inconvenient and sometimes difficult to control, and the reduction in lens aperture has the disadvantage of increasing the depth of field which sometimes detracts from the dramatic effects.

Recent advances in emulsion technology have made it possible to manufacture an extremely fine-grain film capable of producing direct prints and/or duplicate negatives having unusual sharpness. The new film designated as Eastman XT Panchromatic Negative Film, Types 5220 and 7220, has approximately one-third the speed of Eastman Plus-X Panchromatic Negative Film, Types 4231 and 7231, and should be particularly useful in exterior motion-picture photography. The structure of the new film compared to Plus-X is shown in Fig. 1. Important features of the new film are (1) the reduction in emulsion thickness, which has contributed to the improvement in image sharpness, and (2) the addition of a bleachable antihalation layer located directly under the emulsion. The faster speed of the new Eastman 4-X Panchromatic Negative Film extends the available speed range on the high side; the new Eastman XT Panchromatic Negative Film will extend the speed range on the low side. Figure 2 shows the relative speed of the new film compared to Plus-X, Double-X, Tri-X and 4-X. Like Plus-X, the new product has extremely fine grain. The rms granularity measurements made at a gamma of 0.70, comparing the new film with Plus-X, are shown in Fig. 3.

The improvement in image sharpness is reflected in the modulation transfer characteristics shown in Fig. 4.

The lower speed of the new film now makes available a range of speeds capable of handling all levels of scene illumination. The exposure indexes recommended for the new film when developed to a gamma of 0.65 to 0.70 are Daylight 25 and Tungsten 20. These values are

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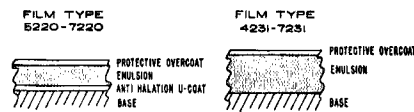


Fig. 1. The structure of the new film in comparison with Plus-X.

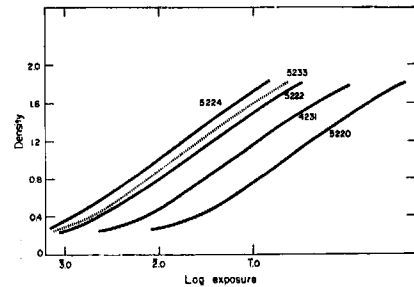


Fig. 2. The relative speed of the new film in comparison with Plus-X, Double-X, Tri-X and 4-X.

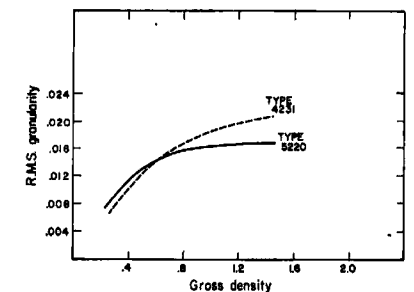


Fig. 3. RMS granularity measurements comparing the new film with Plus-X.

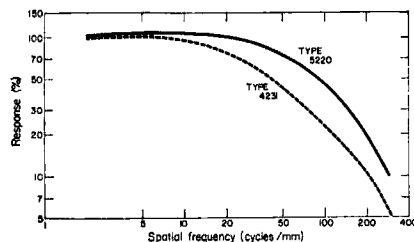


Fig. 4. Modulation transfer characteristics.

compared with other Eastman camera negative films in Table I. The spectral sensitivity curves in Fig. 5 show the new film to be very similar to Plus-X.

The developing, fixing and washing conditions for the new film are close to those used for Eastman Plus-X, Type 4231. A gamma of 0.70 was obtained in a continuous immersion-type machine using Kodak D-96 Developer at 70 F for 4.8 min. Figure 6 shows a family of characteristic curves for a range of development times. The new film is not intended for high-temperature processing.

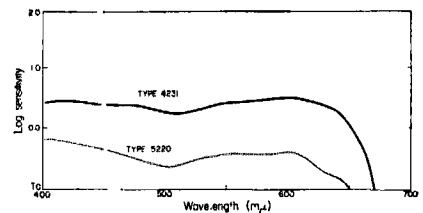


Fig. 5. Spectral sensitivity curves.

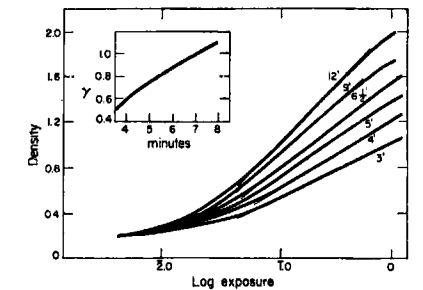


Fig. 6. Characteristic curves.

Those laboratories faced with the problem of processing camera films that have a wide range of speeds frequently ask the question: why cannot all films be manufactured so they will provide the recommended gamma at the same processing time? This, obviously, is a very desirable objective, one that would make life much more pleasant for the laboratory. Progress in emulsion technology, however, is not without its compromises. The faster, coarser-grain films generally have inherently longer development times while the extremely fine-grain films, on the other hand, have inherently higher contrast and consequently shorter development times to provide the same contrast level. These basic facts make it necessary for the laboratory handling a range of film speeds to have sufficient flexibility in its processing times to handle the extended range of film speeds now available.

Table I. Exposure Indexes

Film Type	Daylight	Tungsten
Eastman XT panchromatic neg., Type 5220	25	20
Eastman Plus-X panchromatic neg., Type 4231	80	64
Eastman Double-X panchromatic neg., Type 5222	250	200
Eastman Tri-X panchromatic neg., Type 5233	320	250
Eastman 4-X panchromatic neg., Type 5224	500	400