

EASTMAN KODAK COMPANY

GENERAL OFFICES
343 STATE STREET

ROCHESTER 4, N. Y.

TELEPHONE
LOCUST 6000

May 31, 1955

Dr. Eliot Porter
Route 1, Box 33
Santa Fe, New Mexico

Dear Dr. Porter:

This letter is in further reply to your letter of February 24 to our Mr. Williams in regard to your request for information on dye stability data and reciprocity characteristics of our daylight type color films.

The tests which we make on both Kodachrome and Kodak Ektachrome Film on the 120, 620 and sheet-film sizes are done in this fashion. The processed film contains a neutral density area of about 1.0. The film is stored for one year at 78° F and at 68° relative humidity. After this storage time, the film is removed and the density of this neutral grey patch is read through tri-color filters. Under these storage conditions, no appreciable change in this density takes place. Thus, it seems quite likely that you need not concern yourself with the preparation of color-separation negatives from your transparencies for a considerable period of time after they have been exposed and processed because no visible change will occur. Kodak Ektachrome Film in the 135 size and in the forthcoming 120 and 620 sizes is, of course, such a new product that we have not been able to make these one-year storage tests at normal room temperatures. We are always fearful of correlating the results obtained on accelerated incubation tests with the results obtained in practice at normal temperature and relative humidity. However, our accelerated tests on Ektachrome to date have indicated that the dye stability is very comparable to that of Kodachrome and Ektachrome Films provided the maximum storage temperature does not exceed 120° F.

In regard to resolving power values for films, we would like to point out that there are several factors which enter into a consideration of picture sharpness other than resolving power. Extensive investigation carried out in recent years shows that the resolving power of a photographic film may exert very little influence on the sharpness of images obtained on the film unless the resolving power figure is very low. For the range of resolving power generally encountered, the graininess and particularly the sharpness of the edge of the photographic deposit have a much more important effect. Progress is being made toward a means for obtaining some numerical rating system of sharpness which it is hoped will provide a much more reliable indication of image definition than can be obtained by photographing

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resolving power test charts, or applying various spaced lines to the photographic product.

The actual resolving power figures for these color films are based on the use of a test object with a contrast of 30 to 1 and at the exposure level which in each case gives the highest figure. Normal processing is used. The resolving power figure for Kodachrome exposed under these conditions is 110 to 120, for Kodak Ektachrome Film E135 65, and for Kodak Ektachrome Film in sheets and 120, 620 rolls is 35.

We are afraid that we cannot be very helpful to you in providing you with the reciprocity characteristics of these films. For the amateur products, such as Kodachrome and Ektachrome film in the 135 size, we do not make tests at exposure levels other than those normally used for the product by the photographer. This same procedure is followed in part at least for Kodak Ektachrome film in sheets with the exception that with the artificial-light material, we have given filter recommendations when this film was used at long exposure times since such times are frequently encountered by the commercial photographer in his regular use of the film. The daylight type film is tested only at extremely short exposure times typical of those used with electronic flash equipment. Further, many tests which we may have conducted on our color films should be repeated for every single emulsion which is coated and packaged since the characteristics of the product at long or short exposure times varies from emulsion batch to emulsion batch. Thus, any information which we may have obtained in the past on one or two particular emulsions would not be applicable to current recommendations. There is also some change encountered as the product ages.

We suggest that you carry out your own series of tests with the particular emulsion which you intend to use at these unusual exposure times in order to determine what filters are necessary. As you no doubt realize from the supplementary data information which we pack with our sheet film, the filters required are generally quite dilute and thus the color balance shift due to long exposure or short exposure times is generally of the order of that which can be compensated for by a .05 or .10 filter. Variations in color balance in excess of these levels are frequently encountered in product variations which may have been handled at unsafe storage temperatures, processing variations, and changes in the color quality of daylight illumination.

The following very general information regarding the current roll and sheet film characteristics may nevertheless be helpful to you. As a general rule, with these films we have found that the speed of the film constantly drops above a 10-second level by about one stop for each 10 times increase in exposure. Thus at 100 seconds about one more stop should be given than is computed for a normal time.

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At 1,000 seconds about two stops more exposure is required. The color balance may shift by .05 or .10 density in the following exposure times: 1/100-second - yellow, 1/10-second - red, between 1/10 and 10 seconds - neutral, 10 seconds - cyan, 100 seconds - cyan to green, 1,000 seconds - green.

We are sorry we cannot provide you with more specific information. We hope you will call on us again if you think we can help you.

Yours very truly,

W.D. Libby
Sales Service Division

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