# standards and recommended practices

## Draft USA Standards

Four Draft USA Standards are published here for a trial period and public review. Comments should be addressed to Alex E. Alden, Staff Engineer, at Society Headquarters prior to November 27. The Drafts are also submitted to USA Standards Committee PH22, and all remarks or criticisms received through *Journal* publication will be taken into consideration before action by that Committee is concluded.

Three of the Drafts are new standards specifying dimensions of motion-picture raw stock; Dimensions for 35 mm Motion-Picture Film Perforated 16mm, 3R-2994 (1-3-0), PH22.171; Dimensions for 35mm Motion-Picture Film Perforated 16mm, 3R-3000 (1-3-0), PH22.170; and Dimensions for 35mm Motion-Picture Film Perforated Super 8, 2R-1664 (1-5), PH22.169.

Spectral Diffuse Density of Photographic Sound Record on Three-Component Subtractive Color Films, PH22.117, is a revision of the earlier issue. Although most of the revision is editorial, it should be pointed out that section five now specifies the transmission density as measured with an instrument having a bandwidth peaking at 800 nm instead of 768 nm. It should also be noted that the standard applies to sound records made up of dye images plus silver or a metallic salt. It does not apply to records composed of dyes only.

Draft USA Standard Dimensions for

**35mm Motion-Picture Film Perforated 16mm, 3R-2994 (1-3-0)**

PH22.171



### 1. Scope

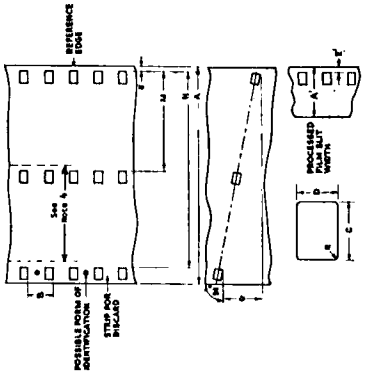
This standard specifies the cutting and perforating dimensions for 35mm motion-picture film with 16mm perforations in positions 1-3-0 and a perforation pitch of 0.2994 in. The width of the 16mm strip after processing and slitting is also specified.

### 2. Dimensions

**2.1** The dimensions shall be as given in the figure and table.

**2.2** The dimensions pertain to a safety film as defined in USA Standard Motion-Picture Safety Film, PH22.31-1958.

**2.3** Except for Dimensions A' and E', the dimensions apply to the 35mm film immediately after cutting and perforating. Dimensions A' and E' apply to the 16mm strips immediately after slitting.




| | Dimensions | Inches | | Millimeters | |
|---|---|---|---|---|---|
| A | Film width | 1.377 ± 0.001 | | 34.975 ± 0.025 | |
| A' | Film width after processing and slitting | 0.627 ± 0.002 | | 15.93 ± 0.05 | |
| B | Perforation pitch | 0.2994 ± 0.0005 | | 7.605 ± 0.013 | |
| C | Perforation width | 0.0720 ± 0.0004 | | 1.829 ± 0.010 | |
| D | Perforation height | 0.0500 ± 0.0004 | | 1.270 ± 0.010 | |
| E | Reference edge to first perforation row | 0.0355 ± 0.0020 | | 0.902 ± 0.051 | |
| E' | Edge to perforation after processing and slitting | 0.0355 ± 0.0020 | | 0.902 ± 0.051 | |
| G | Perforation skewness | 0.001 | max | 0.03 | max |
| L | 100 consecutive perforation pitch intervals | 29.94 | ± 0.03 | 760.5 | ± 0.8 |
| M | Reference edge side of first perforation row to second perforation row | 0.628 | ± 0.001 | 15.95 | ± 0.03 |
| N | Reference edge side of first perforation row to third perforation row | 1.234 | ± 0.001 | 31.34 | ± 0.03 |
| R | Radius of perforation fillet | 0.010 | ± 0.001 | 0.25 | ± 0.03 |

NOT APPROVED

**2.4** Dimension L represents the length of any 100 consecutive perforation pitch intervals.

NOTE 1: The title of this standard was established by the application of a nomenclature system developed for all film dimension standards: Each title provides an indication of the film width, a code designation for the perforation shape (BH, KS, DH, or CS) or the number of rows of perforations (1R, 2R, etc.), depending upon which is the significant factor, and the perforation pitch without the decimal point.

The numerals have been added to the title of this standard to specify how the rows of perforations are placed on the film. This designation is necessary only when the film stock is wider than its end use and more than one combination of perforation rows is possible. For 16mm-type perforations on 35mm-width film, a maximum of four usable rows of perforations is possible. The perforation rows shall be numbered starting at the reference edge. The reference edge is that edge of the strip nearest to the row of perforations which is retained on one of the slit prints that is not discarded in any subsequent slitting. A row of perforations which is discarded will always be given the number 0. Negative or intermediate films which are not slit may contain a 0-numbered row of perforations if that perforated row corresponds to the discard row of perforations on the subsequent print stock. For all films with dissymmetrical perforation rows, there could be two different windings for the same numbered rows of perforations. Film perforated 1-0 would be 1-0 regardless of winding, but depending on the location of the reference edge, the winding could be A or B, according to USA Standard A and B Windings of 16mm Film, Perforated One Edge, PH22.75-1953 (Reaffirmed 1961).

NOTE 2: The perforations in the 0-numbered discard row are provided with a visible means of identification.

NOTE 3: Dimension A' represents the film width and Dimension E' the edge to perforation distance after slitting a nominal 16mm strip from the exposed and processed parent 35mm-width film. In deriving the dimension of 0.627 in., the specified film shrinkage characteristics described in Appendix A2 have been taken into account.

NOTE 4: The dotted lines in the figure indicate the edge of the 16mm cuts after slitting.

NOTE 5: The metric values in the table of dimensions are converted from the inch values in accordance with conversion principles outlined in USA Standard Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1933 (Reaffirmed 1947). The metric conversion of Dimension A is purposely shown in three figures to prevent the maximum width dimension from exceeding 35mm.

## Appendix

(This Appendix is not a part of Draft USA Standard Dimensions for 35mm Motion-Picture Film Perforated 16mm, 3R·2994 (1-3-0), PH22.171, but is included to facilitate its use.)

**A1.** The dimensions given in this standard, excluding Dimensions A' and E', represent the practice of film manufacturers in that the dimensions and tolerances are for film stock immediately after perforation. The punches and dies themselves are made to tolerances considerably smaller than those given, but since film is a plastic material, the dimensions of the slit and perforated film stock never agree exactly with the dimensions of the slitters, punches, and dies. Film can shrink or swell due to loss or gain in moisture content or can shrink due to loss of solvent. These changes invariably result in changes in the dimensions during the life of the film. The change is generally uniform throughout a roll.

**A2.** It will be noted that among the various standards for slitting and perforating film stock there are often two standards that seem much alike in wording. The difference lies in the longitudinal pitch which is either 0.3000 in. or 0.2994 in. for this standard. In general, the longer pitch is for print stock and the shorter pitch is for negative or intermediate stock.

The choice of pitch for negative or intermediate motion-picture film depends, within certain limits, on the type of printer to be used. Where release step printers are used and the film is stationary when exposed, the choice of pitch is not strictly limited. Where the film moves continuously over a cylindrical surface at time of printing (sprocket-type contact printer), there are three major considerations involved in choosing the pitch. These considerations are: (1) the sprocket diameter and tooth engagement, (2) the film thickness, and (3) the film shrinkage and the rate at which shrinkage occurs.

Maximum steadiness and definition are secured on a sprocket-type printer when the negative stock is somewhat shorter in pitch than the positive stock in the approximate proportion of the thickness of the film to the radius of curvature. For printing on a 40-tooth 16mm sprocket (circumference of about 12 in.) with film 0.0055 to 0.0065 in. thick, the optimum pitch differential is 0.3 percent. The use of the ideal pitch differential for the negative would minimize slippage between the positive stock and negative during the printing operation, thus reducing the amount of blurring and jumping in the vertical axis of the picture or sound image. (This error is to be differentiated from the jump caused by nonuniformity of successive pitches, Dimension B.)

Experience has shown that the average pitch derived from Dimension L of the intermediate can vary ± 0.1 percent from the ideal pitch, which is 0.3 percent shorter than the positive stock, without blurring of picture and sound image being easily detected.





For many years this desired difference in pitch was caused by the shrinkage of the negative film during processing and aging. Current film bases shrink less than the earlier ones and hence a shorter initial pitch becomes desirable. To satisfy this requirement for picture- or sound-negatives, it is common manufacturing practice to aim for a pitch value 0.2 percent shorter than the positive stock onto which they will be printed. The additional shrinkage that occurs during processing and the aging that takes place before the release prints are made then bring the pitch differential close to the optimum and desired value of 0.3 percent. Accordingly, the pitch chosen for the negative or intermediate stock is 0.2994 in.

Low-shrinkage negative film perforated to these dimensions should not thereafter shrink appreciably more than 0.2 percent under normal use conditions, and for a reasonable life span, so that the optimum pitch differential from the positive stock of 0.3 ± 0.1 percent is maintained. (The film should be measured after equilibration with air at 70°F and 55 percent relative humidity or at the conditions prevailing at the time of perforating.)

**A3.** The uniformity of pitch, hole size, and margin (Dimensions B, C, D, and E) is an important variable affecting steadiness. Variations in these dimensions, from roll to roll, are of little significance compared to variations from one perforation to the next within any small group of consecutive perforations. As an example, the uniformity of the margin is uniquely critical for optical printing. During the printing process, the placement of the image on the film is usually with respect to successive lateral pairs of perforations at one-frame intervals. During subsequent projection, however, the portion of the image projected is usually located, not by these perforations, but by the edge of the film. The lateral steadiness of the projected image is therefore directly related to the frame-to-frame uniformity of the margin.



Page 3 of 3 pages

than the positive stock, without blurring of picture and sound image being easily detected.

For many years this desired difference in pitch was caused by the shrinkage of the negative film during processing and aging. Current film bases shrink less than the earlier ones and hence a shorter initial pitch becomes desirable. To satisfy this requirement for picture- or sound-negatives, it is common manufacturing practice to aim for a pitch value 0.2 percent shorter than the positive stock onto which they will be printed. The additional shrinkage that occurs during processing and the aging that takes place before the release prints are made then bring the pitch differential close to the optimum and desired value of 0.3 percent. Accordingly, the pitch chosen for the negative or intermediate stock is 0.2994 in.

Low-shrinkage negative film perforated to these dimensions should not thereafter shrink appreciably more than 0.2 percent under normal use conditions, and for a reasonable life span, so that the optimum pitch differential from the positive stock of 0.3 ± 0.1 percent is maintained. (The film should be measured after equilibration with air at 70°F and 55 percent relative humidity or at the conditions prevailing at the time of perforating.)

**A3.** The uniformity of pitch, hole size, and margin (Dimensions B, C, D, and E) is an important variable affecting steadiness. Variations in these dimensions, from roll to roll, are of little significance compared to variations from one perforation to the next within any small group of consecutive perforations. As an example, the uniformity of the margin is uniquely critical for optical printing. During the printing process, the placement of the image on the film is usually with respect to successive lateral pairs of perforations at one-frame intervals. During subsequent projection, however, the portion of the image projected is usually located, not by these perforations, but by the edge of the film. The lateral steadiness of the projected image is therefore directly related to the frame-to-frame uniformity of the margin.

Draft USA Standard Dimensions for

# 35mm Motion-Picture Film Perforated 16mm, 3R-3000 (1-3-0)

PH22.170



## 1. Scope

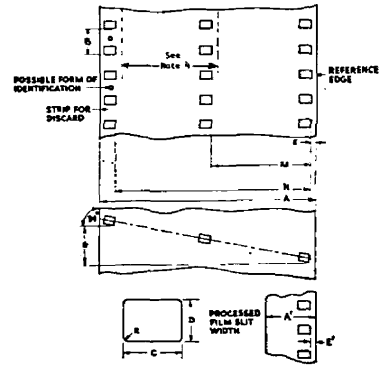
This standard specifies the cutting and perforating dimensions for 35mm motion-picture film with 16mm perforations in positions 1-3-0 and a perforation pitch of 0.3000 in. The width of the 16mm strip after processing and slitting is also specified.

## 2. Dimensions

**2.1** The dimensions shall be as given in the figure and table.

**2.2** The dimensions pertain to a safety film as defined in USA Standard Motion-Picture Safety Film, PH22.31-1958.

**2.3** Except for Dimensions A′ and E′, the dimensions apply to the 35mm film immediately after cutting and perforating. Dimensions A′ and E′ apply to the 16mm strips immediately after slitting.




| | Dimensions | Inches | Millimeters |
|---|---|---|---|
| A | Film width | 1.377 ± 0.001 | 34.975 ± 0.025 |
| A′ | Film width after processing and slitting | 0.627 ± 0.002 | 15.93 ± 0.05 |
| B | Perforation pitch | 0.3000 ± 0.0005 | 7.620 ± 0.013 |
| C | Perforation width | 0.0720 ± 0.0004 | 1.829 ± 0.010 |
| D | Perforation height | 0.0500 ± 0.0004 | 1.270 ± 0.010 |
| E | Reference Edge to first perforation row | 0.0355 ± 0.0020 | 0.902 ± 0.051 |
| E′ | Edge to perforation after processing and slitting | 0.0355 ± 0.0020 | 0.902 ± 0.051 |
| G | Perforation skewness | 0.001 max | 0.03 max |
| L | 100 consecutive perforation pitch intervals | 30.00 ± 0.03 | 762.0 ± 0.8 |
| M | Reference edge side of first perforation row to second perforation row | 0.628 ± 0.001 | 15.95 ± 0.03 |
| N | Reference edge side of first perforation row to third perforation row | 1.234 ± 0.001 | 31.34 ± 0.03 |
| R | *Radius of perforation fillet* | 0.010 ± 0.001 | 0.25 ± 0.03 |

NOT APPROVED





**2.4** Dimension L represents the length of any 100 consecutive perforation pitch intervals.

NOTE 1: The title of this standard was established by the application of a nomenclature system developed for all film dimension standards: *Each title provides an indication* of the film width, a code designation for the perforation shape (BH, KS, DH, or CS) or the number of rows of perforations (1R, 2R, etc.), depending upon which is the significant factor, and the perforation pitch without the decimal point.

The numerals have been added to the title of this standard to specify how the rows of perforations are placed on the film. *This designation is necessary only* when the film stock is wider than its end use and more than one combination of perforation rows is possible. For 16mm-type perforations on 35mm-width film, a maximum of four usable rows of perforations is possible. The perforation rows shall be numbered starting at the reference edge. The reference edge is that edge of the strip nearest to the row of perforations which is retained on one of the slit prints that is not discarded in any subsequent slitting. A row of perforations which is discarded will always be given the number 0. Negative or intermediate films which are not slit may contain a 0-numbered row of perforations if that perforated row corresponds to the discard row of perforations on the subsequent print stock. For all films with dissymmetrical perforation rows, there could be two different windings for the same numbered rows of perforations. Film perforated 1-0 would be 1-0 regardless of winding, but depending on the location of the reference edge, the winding could be A or B, according to USA Standard A and B Windings of 16mm Film, Perforated One Edge, PH22.75-1953 (Reaffirmed 1961).

NOTE 2: The perforations in the 0-numbered discard row are provided with a visible means of identification.

NOTE 3: Dimension A′ represents the film width and Dimension E′ the edge to perforation distance after slitting a nominal 16mm strip from the exposed and processed parent 35mm-width film. In deriving the dimension of 0.627 in., the specified film shrinkage characteristics described in Appendix A2 have been taken into account.

NOTE 4: The dotted lines in the figure indicate the edge of the 16mm cuts after slitting.

NOTE 5: The metric values in the table of dimensions are converted from the inch values in accordance with conversion principles outlined in USA Standard Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1933 (Reaffirmed 1947). The metric conversion of Dimension A is purposely shown in three figures to prevent the maximum width dimension from exceeding 35mm.

## Appendix

(This Appendix is not a part of Draft USA Standard Dimensions for 35mm Motion-Picture Film Perforated 16mm, 3R-3000 (1-3-0), PH22.170, but is included to facilitate its use.)

**A1.** The dimensions given in this standard, excluding Dimensions A′ and E′, represent the practice of film manufacturers in that the dimensions and tolerances are for film stock immediately after perforation. The punches and dies themselves are made to tolerances considerably smaller than those given, but since film is a plastic material, the dimensions of the slit and perforated film stock never agree exactly with the dimensions of the slitters, punches, and dies. Film can shrink or swell due to loss or gain in moisture content or can shrink due to loss of solvent. These changes invariably result in changes in the dimensions during the life of the film. The change is generally uniform throughout a roll.

**A2.** It will be noted that among the various standards for slitting and perforating film stock there are often two standards that seem much alike in wording. The difference lies in the longitudinal pitch which is either 0.2994 in. or 0.3000 in. for this standard. In general, the longer pitch is for print stock and the shorter pitch is for negative or intermediate stock.

The choice of pitch for negative or intermediate motion-picture film depends, within certain limits, on the type of printer to be used. Where release step printers are used and the film is stationary when exposed, the choice of pitch is not strictly limited. Where the film moves continuously over a cylindrical surface at time of printing (sprocket-type contact printer), there are three major considerations involved in choosing the pitch. These considerations are: (1) the sprocket diameter and tooth engagement, (2) the film thickness, and (3) the film shrinkage and the rate at which shrinkage occurs.

Maximum steadiness and definition are secured on a sprocket-type printer when the negative stock is somewhat shorter in pitch than the positive stock in the approximate proportion of the thickness of the film to the radius of curvature. For printing on a 40-tooth 16mm sprocket (circumference of about 12 in.) with film 0.0055 to 0.0065 in. thick, the optimum pitch differential is 0.3 percent. The use of the ideal pitch differential for the negative would minimize slippage between the positive stock and negative during the printing operation, thus reducing the amount of blurring and jumping in the vertical axis of the picture or sound image. (This error is to be differentiated from the jump caused by nonuniformity of successive pitches, Dimension B.)

Experience has shown that the average pitch derived from Dimension L of the intermediate can vary ± 0.1 percent from the ideal pitch, which is 0.3 percent shorter

Draft USA Standard Dimensions for

# 35mm Motion-Picture Film Perforated Super 8, 2R-1664 (1-5)

PH22.169



## 1. Scope

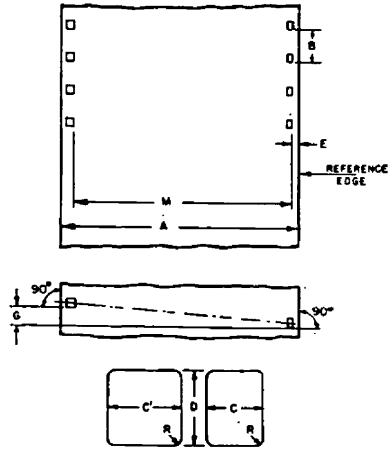
This standard specifies the cutting and perforating dimensions for 35mm motion-picture film with one row of super 8 perforations and one row of special perforations having a perforation pitch of 0.1664 in. The film stock described in this standard is intended for use as an intermediate film in the production of prints.

## 2. Dimensions

**2.1** The dimensions shall be as given in the figure and table.

**2.2** The dimensions pertain to a safety film as defined in USA Standard Motion-Picture Safety Film, PH22.31-1958.

**2.3** The dimensions apply to material immediately after cutting and perforating.




| | Dimensions | Inches | Millimeters |
|---|---|---|---|
| A | Film width | 1.377 ± 0.001 | 34.975 ± 0.025 |
| B | Perforation pitch | 0.1664 ± 0.0004 | 4.227 ± 0.010 |
| C | Perforation width | 0.0360 ± 0.0004 | 0.914 ± 0.010 |
| C' | Identification perforation width | 0.0450 ± 0.0004 | 1.143 ± 0.010 |
| D | Perforation height | 0.0450 ± 0.0004 | 1.143 ± 0.010 |
| E | Edge to perforation | 0.050 ± 0.002 | 1.27 ± 0.05 |
| G | Perforation skewness | 0.0015 max | 0.038 max |
| L | 100 consecutive perforation pitch intervals | 16.640 ± 0.017 | 422.70 ± 0.43 |
| M | Lateral perforation displacement | 1.251 ± 0.001 | 31.78 ± 0.03 |
| R | Radius of perforation fillet | 0.005 ± 0.001 | 0.13 ± 0.03 |





**2.4** Dimension L represents the length of any 100 consecutive perforation pitch intervals.

NOTE 1: The title of this standard was established by the application of a nomenclature system developed for all film dimension standards: Each title provides an indication of the film width, a code designation for the perforation shape (BH, KS, DH, or CS) or the number of rows of perforations (1R, 2R, etc.), depending upon which is the significant factor, and the perforation pitch without the decimal point.

NOTE 2: The metric values in the table of dimensions are converted from the inch values in accordance with conversion principles outlined in USA Standard Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1933 (Reaffirmed 1947). The metric conversion of Dimension A is purposely shown in three figures to prevent the maximum width dimension from exceeding 35mm.

NOTE 3: The perforations in the fifth row have a lesser edge-to-perforation distance and correspond to the row of perforations discarded when the subsequent print stock is slit. This row of perforations will be provided with a means of identification which is visible on the raw film.

## Appendix

(This Appendix is not a part of Draft USA Standard Dimensions for 35mm Motion-Picture Film Perforated Super 8, 2R-1664 (1-5), PH22.169, but is included to facilitate its use.)

**A1.** The dimensions given in this standard represent the practice of film manufacturers in that the dimensions and tolerances are for film stock immediately after perforation. The punches and dies themselves are made to tolerances considerably smaller than those given, but since film is a plastic material, the dimensions of the slit and perforated film stock never agree exactly with the dimensions of the slitters, punches and dies. Film can shrink or swell due to loss or gain in moisture content or can shrink due to loss of solvent. These changes invariably result in changes in the dimensions during the life of the film. The change is generally uniform throughout a roll.

**A2.** It will be noted that among the various standards for slitting and perforating film stock there are often two standards that seem much alike in wording. The difference lies in the longitudinal pitch which is either 0.1667 in. or 0.1664 in. for this standard. In general, the longer pitch is for print stock and the shorter pitch is for negative or intermediate stock.

The choice of pitch for negative or intermediate motion-picture film depends, within certain limits, on the type of printer to be used. Where release step-printers are used and the film is stationary when exposed, the choice of pitch is not strictly limited. Where the film moves continuously over a cylindrical surface at time of printing (sprocket-type contact printer), there are three major considerations involved in choosing the pitch. These considerations are: (1) the sprocket diameter and tooth engagement, (2) the film thickness, and (3) the film shrinkage and the rate at which shrinkage occurs.

Maximum steadiness and definition are secured on a sprocket-type printer when the negative stock is somewhat shorter in pitch than the positive stock in the approximate proportion of the thickness of the film to the radius of curvature. For printing on a 72-tooth sprocket (circumference of about 12 in.) with film 0.0055 to 0.0065 in. thick, the optimum pitch differential is 0.3 percent. The use of the ideal pitch differential for the negative would minimize slippage between the positive stock and negative during the printing operation, thus reducing the amount of blurring and jumping in the vertical axis of the picture or sound image. (This error is to be differentiated from the jump caused by nonuniformity of successive pitches, Dimension B.)

Experience has shown that the average pitch derived from Dimension L of the intermediate can vary ± 0.1 percent from the ideal pitch, which is 0.3 percent shorter than the positive stock, without blurring of picture and sound image being easily detected.

For many years this desired difference in pitch was caused by the shrinkage of the negative film during processing and aging. Current film bases shrink less than the earlier ones and hence a shorter initial pitch becomes desirable. To satisfy this requirement for picture- or sound-negatives, it is common manufacturing practice to aim for a pitch value 0.2 percent shorter than the positive stock onto which they will be printed. The additional shrinkage that occurs during processing and the aging that takes place before the release prints are made then bring the pitch differential close to the optimum and desired value of 0.3 percent. Accordingly, the pitch chosen for the negative or intermediate stock is 0.1664 in.

Low-shrinkage negative film perforated to these dimensions should not thereafter shrink appreciably more than 0.2 percent under normal use conditions, and for a reasonable life span, so that the optimum pitch differential from the positive stock of 0.3 ± 0.1 percent is maintained. (The film should be measured after equilibration with air at 70°F and 55 percent relative humidity or at the conditions prevailing at the time of perforating.)

**A3.** The uniformity of pitch, hole size, and margin (Dimensions B, C, D, and E) is an important variable affecting steadiness. Variations in these dimensions, from roll to roll, are of little significance compared to variations from one perforation to the next within any small group

Draft USA Standard

# Spectral Diffuse Density of Photographic Sound Record on Three-Component Subtractive Color Films

**PH22.117**
Revision of
PH22.117-1960



## Introduction

The purpose of this standard is to supplement USA Standard Spectral Diffuse Densities of Three-Component Subtractive Color Films, PH2.1-1952, by specifying spectral conditions suitable for determining the sensitometric characteristics of photographic sound record on three-component subtractive color films having records made up of dye images plus silver or a metallic salt. It does not apply to the density measurement of records composed of dyes only. The conditions of this standard are intended for, and are applicable to, systems of sound reproduction using the S-1 photosurface, since this photosurface is in common use at the present time. It is recognized that there are other types of photosurfaces sometimes used for photographic sound reproduction that do not fall within the scope of this standard. This standard defines a practical condition by means of which it is expected that most density measurements will be made.

## 1. Purpose and Scope

**1.1** The principal purpose of this standard is to supplement USA Standard Diffuse Transmission Density, PH2.19-1959, and USA Standard Spectral Diffuse Densities of Three-Component Subtractive Color Films, PH2.1-1952.

**1.2** This standard defines conditions suitable for integral spectral density measurement of a photographic sound record on three-component subtractive color films composed of dyes plus silver or some metallic salt.

**1.3** It is recognized that there are other useful types of photographic sound-record density measurements that do not fall within the scope of this standard.

## 2. USA Standard Diffuse Transmission Density

The following sections of USA Standard Diffuse Transmission Density, PH2.19-1959, are part of this standard:

2. General Definition of Density
3. Totally Diffuse Density
4. USA Standard Diffuse Density

## 3. USA Standard Spectral Diffuse Densities of Three-Component Subtractive Color Films

The following section of USA Standard Spectral Diffuse Densities of Three-Component Subtractive Color Films, PH2.1-1952, is part of this standard:

2. Terminology Used in the Densitometry of Color Film

## 4. Terminology Used in the Densitometry of Photographic Color Sound Records

**4.1 Peak Response.** The peak response of a densitometer is the wavelength to which the densitometer has the greatest response, including such factors as the spectral emission of the light source, the combined spectral transmission of all optical filters in the light path, and the spectral sensitivity of the photosensitive receptor.

**4.2 Bandwidth.** The bandwidth of a densitometer is the range of wavelengths to which the densitometer is sensitive. In a practical densitometer this range of wavelengths is not sharply defined; but for the purposes of this standard, the bandwidth shall be considered to lie between





of consecutive perforations. As an example, the uniformity of the margin is uniquely critical for optical printing. During the printing process, the placement of the image on the film is usually with respect to successive lateral pairs of perforations at one-frame intervals. During subsequent projection, however, the portion of the image projected is usually located, not by these perforations, but by the edge of the film. The lateral steadiness of the projected image is therefore directly related to the frame-to-frame uniformity of the margin.





those wavelengths which excite, in the photosensitive receptor, one-half the current which is excited at the wavelength of peak response. These limiting wavelengths are to be measured or computed using the light source, all operating optical filters, and the photosensitive receptor of the densitometer.

**4.3 Overall Response.** The overall response of a densitometer is the integrated response of the densitometer to all wavelengths, including such factors as the spectral emission of the light source, the combined spectral transmission of all optical filters in the light path, and the spectral sensitivity of the photosensitive receptor.

## 5. USA Standard Spectral Density of Photographic Sound Record on Three-Component Subtractive Color Films

USA Standard spectral diffuse density of photographic sound record on three-component subtractive color films is USA Standard diffuse transmission density as measured with an instrument having a response of 20 nm bandwidth peaking at 800 nm ± 5 nm, with at least 80 percent of the overall response of the instrument falling within the 20 nm bandwidth.

## Appendix

(This Appendix is not a part of Draft USA Standard Spectral Diffuse Density of Photographic Sound Record on Three-Component Subtractive Color Films, PH22.117, but is included to facilitate its use.)

In three-component subtractive color films, dyes or color couplers are used to form the photographic image. These color materials are designed primarily for the visual region, but sound-record reproduction via the S-1 photosurfaces uses the infrared region of approximately 700 to 900 nm, which is far enough away from the visual region so that the color materials cannot be used efficiently, but close enough so that they produce a measurable effect. The spectral characteristics of this effect depend on the type of light-absorbing material used for the sound record, and on the manner in which the sound record is processed. Therefore, in order to obtain uniformity of sound record densitometry among different films, and among the different density-measuring instruments, it is necessary to specify the spectral conditions under which these density measurements are made. It is the aim of this standard to define these conditions sufficiently to ensure reasonable uniformity of density measurements, yet not so rigidly as to make impractical the obtaining of such measurements.