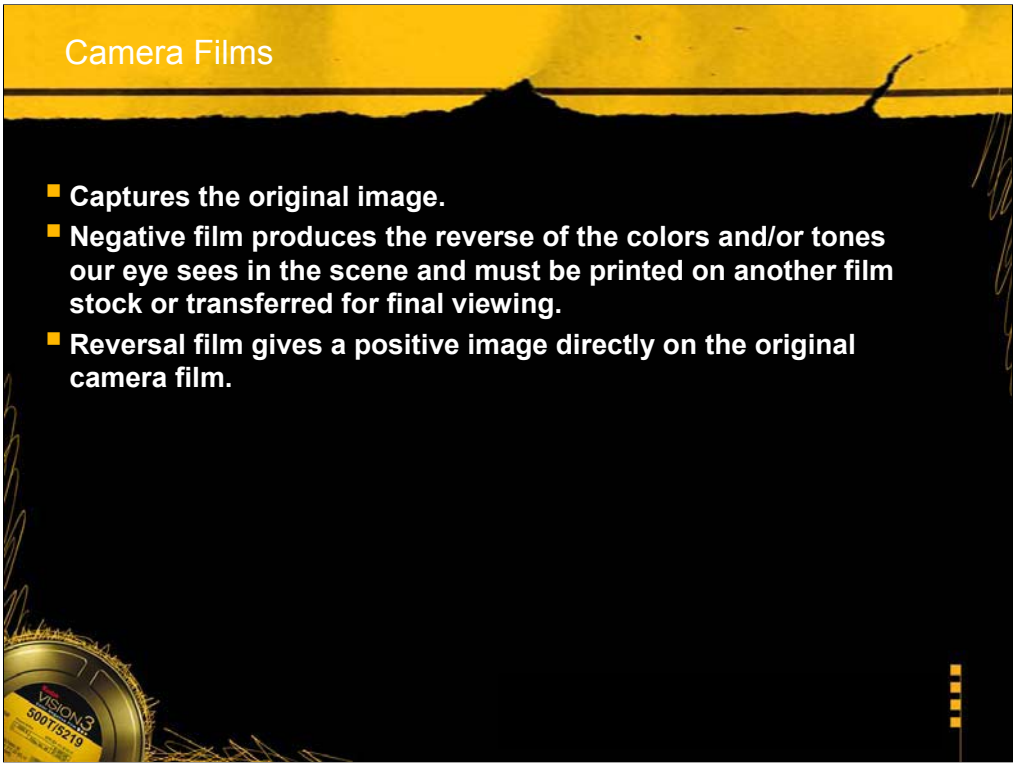
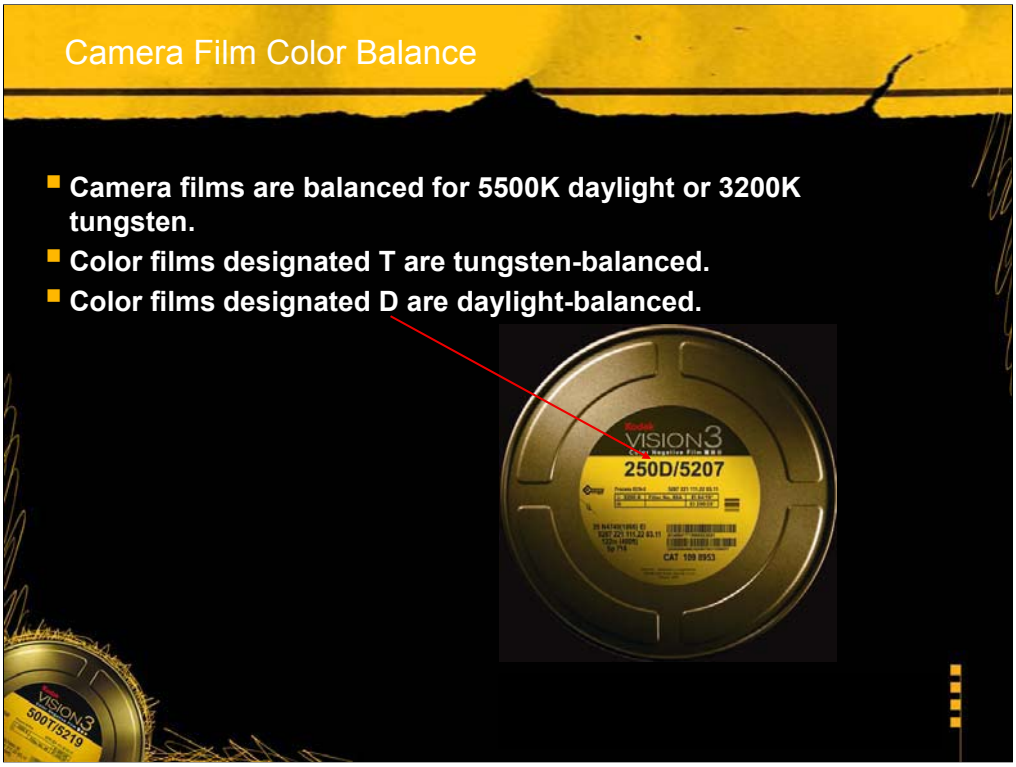
In this chapter, we'll look at different film sizes, along with the different formats and aspect ratios you can employ to achieve the look you want. A wide variety of camera films are available today, allowing filmmakers to convey exactly the look they envision. Image capture challenges, from routine through extreme, special effects, and unique processing and projection requirements can be resolved with today's sophisticated films.

There are three major categories of motion picture films: camera, intermediate and laboratory, and print films. All are available as color or black-and-white films.



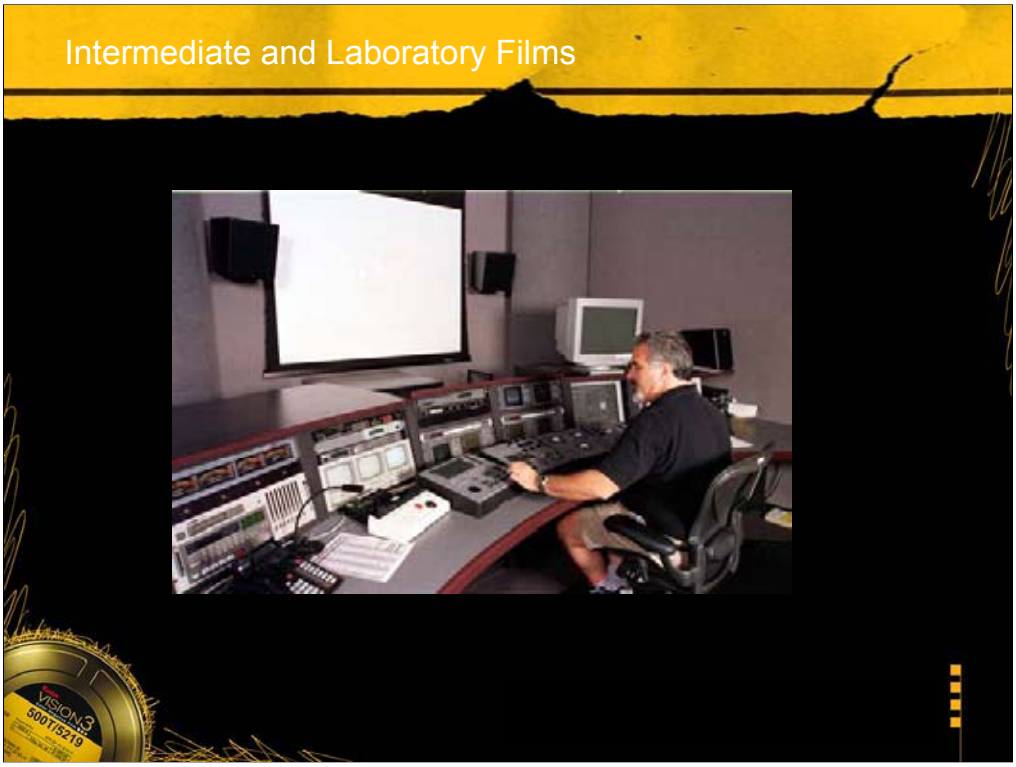
Negative and reversal camera films are used in motion picture cameras to capture the original image. Negative film, just as a still camera negative, produces the reverse of the colors and/or tones our eye sees in the scene and must be printed on another film stock or transferred for final viewing.

Reversal film gives a positive image directly on the original camera film. The original can be projected and viewed without going through a print process. Reversal film has a higher contrast than a camera negative film.



Color films are manufactured for use in a variety of light sources without additional filtration. Camera films are balanced for 5500K daylight or 3200K tungsten. Color films designated D are daylight-balanced. Color films designated T are tungsten-balanced.

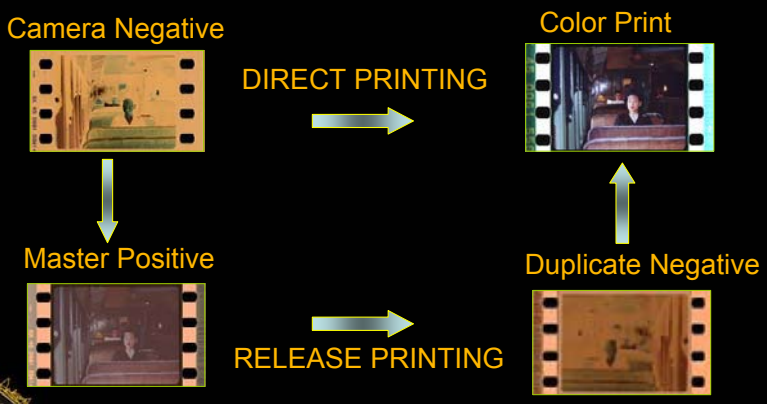
Filtration over the camera lens or over the light source is used when filming in light sources different from the film's balance.

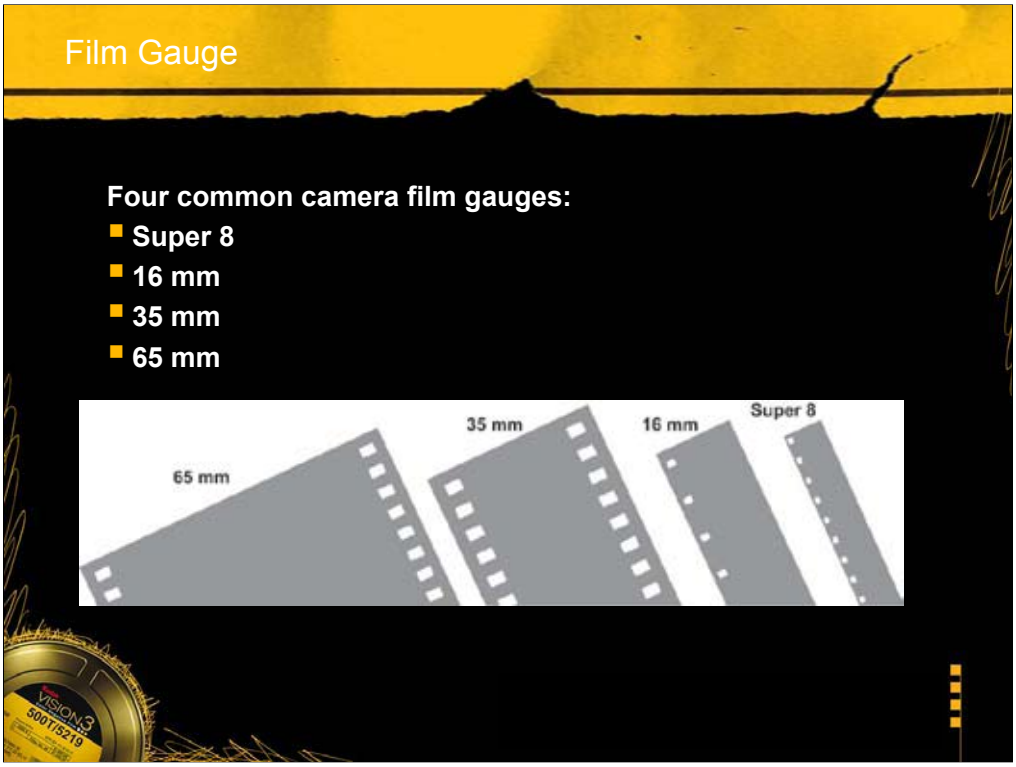


Labs and postproduction facilities use intermediate and print films to produce the intermediate stages needed for special effects and titling. Once the film has been edited, the cut negative may be transferred to print film. This is often done using intermediates to protect the valuable original footage from potential damage. Today, many feature films are post-produced digitally: the camera negative film is scanned to produce a Digital Intermediate; after digital editing and special effects work, a digital negative is produced on color intermediate film using a digital film recorder.

Print Films

Print film is used to print both the first work print (when work print is being used) and multiple copies of the final edited version.





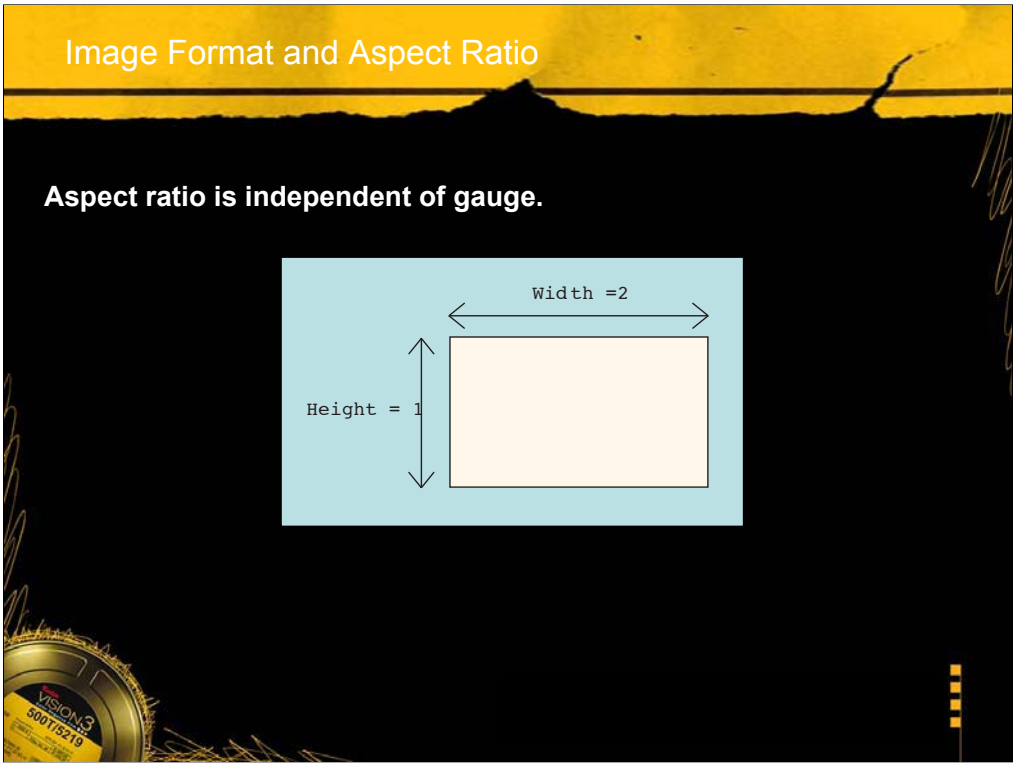
Gauge refers to the width of the film, and there are four commonly in use for camera films: Super 8, 16 mm, 35 mm, and 65 mm.

35 mm is most popular for feature films, commercials and US television. It can be printed to 35 mm print film or scanned or transferred on a telecine.

16 mm film is typically supplied in single perforated format except for use in high-speed cameras, which use double perforated film. The Super 16 format is typically used for low to medium budget feature films, where it can be blown-up to 35 mm release prints. It is also widely used for television production, where its aspect ratio fits 16:9 wide-screen format well.

Super 8 is available as both negative film or reversal film.

The 65 mm format is used as a camera film gauge for making prints on 70 mm print film for widescreen presentation such as IMAX and OMNIMAX.



The film image format describes only the image aspect ratio (shape). 35 mm or 65 mm gauges can have several image formats, because aspect ratio is independent of gauge.

The aspect ratio is the relationship between the width and height of an image. An image that's twice as wide as it is high has an aspect ratio of 2:1.

Rules for Aspect Ratios

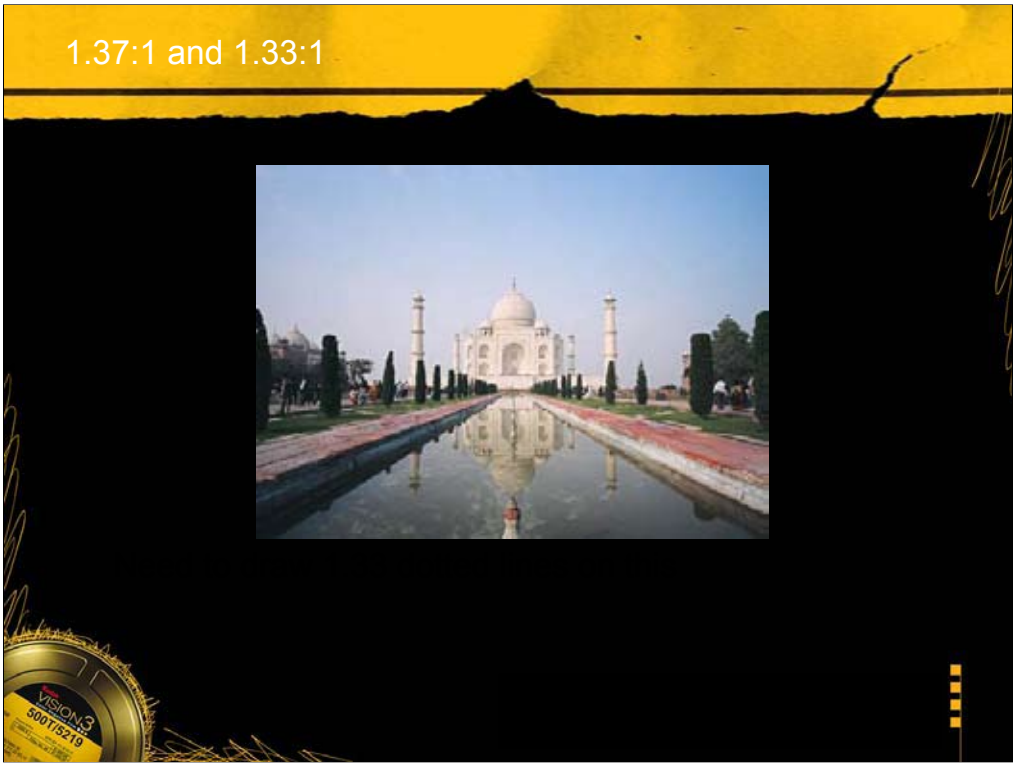
•Aspect ratio = width divided by height

•Aspect ratios are independent of the film gauge (the width of the film)

•Aspect ratios are expressed two ways:

– As a ratio with the height as unity, for example 1.78:1 (used for film)

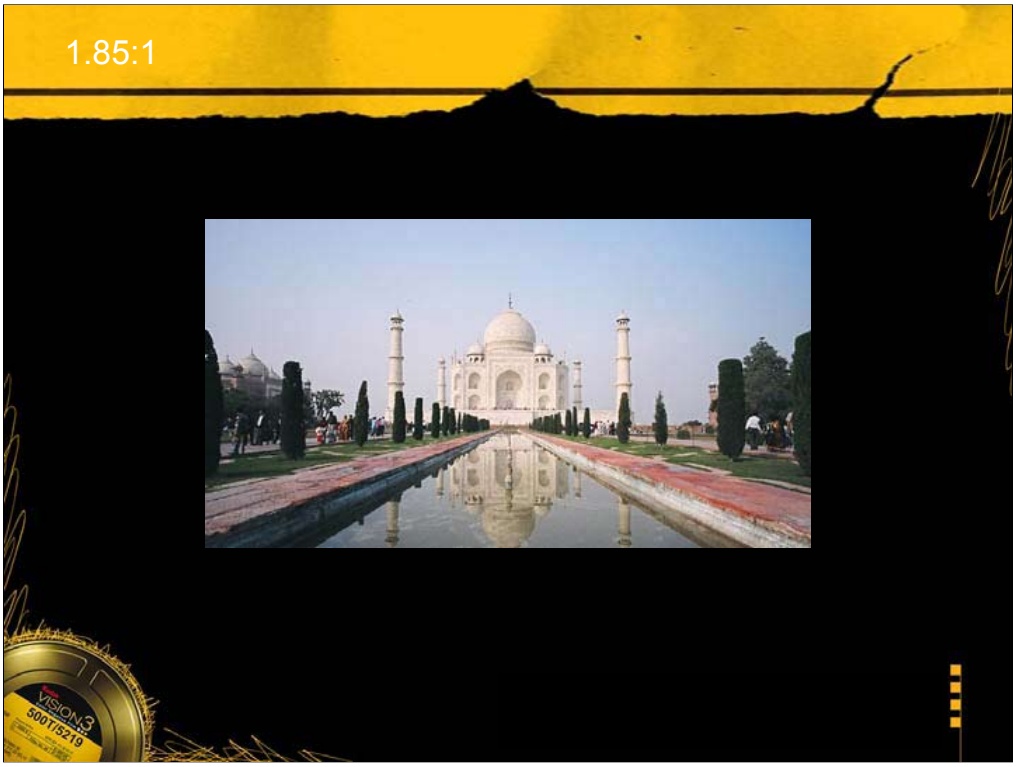
– As a simple ratio with the width and height as whole numbers, for example 16:9, or 16x9 (used for widescreen or HDTV)



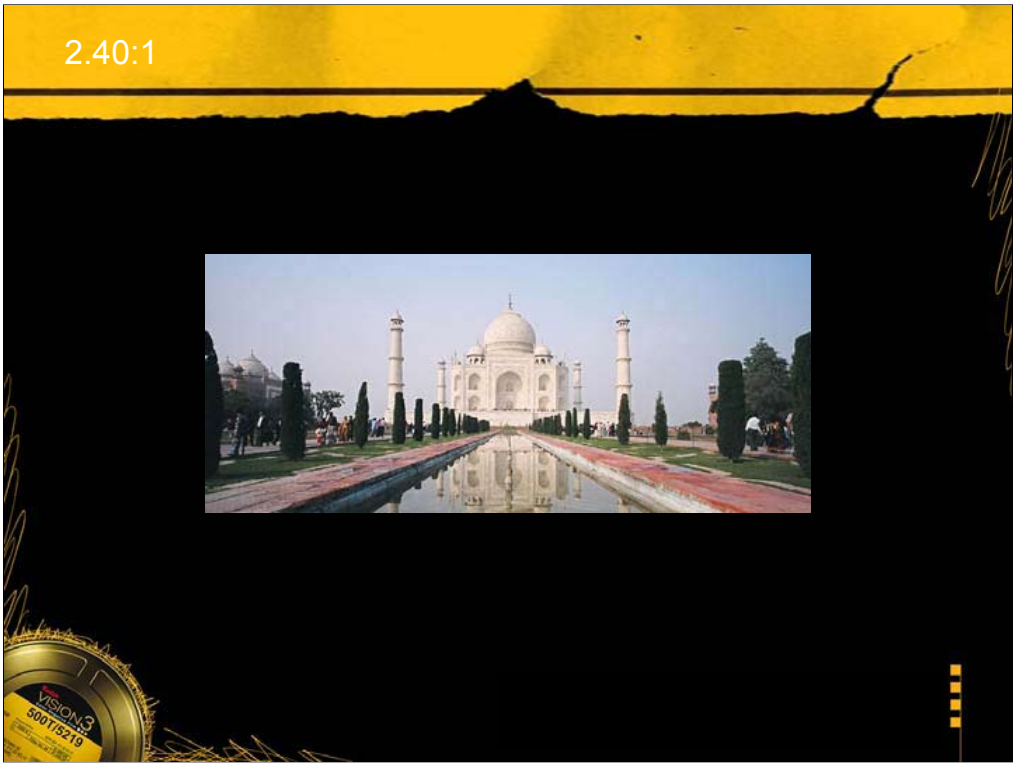
The industry standard for 35 mm theatrical motion pictures remained a constant 1.37:1 between the introduction of sound and the introduction of CINEMASCOPE in 1953.

The full picture shows the 1.37:1 aspect ratio. The dotted lines show the border of the very similar 1.33:1 ratio.

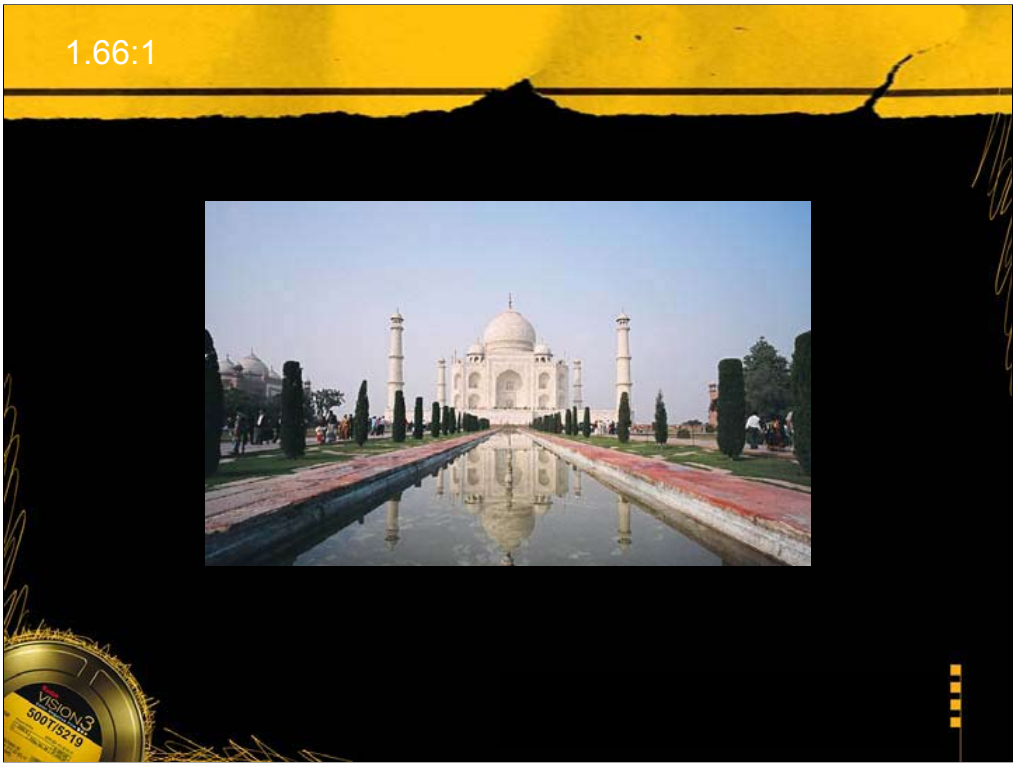
1.33:1 is the standard TV/Video ratio (expressed as 4:3 in the TV industry). It was based on the 1:1.37 aspect ratio. These two ratios are so similar that they are sometimes used interchangeably. This is also the aspect ratio of regular 16 mm and Super 8.



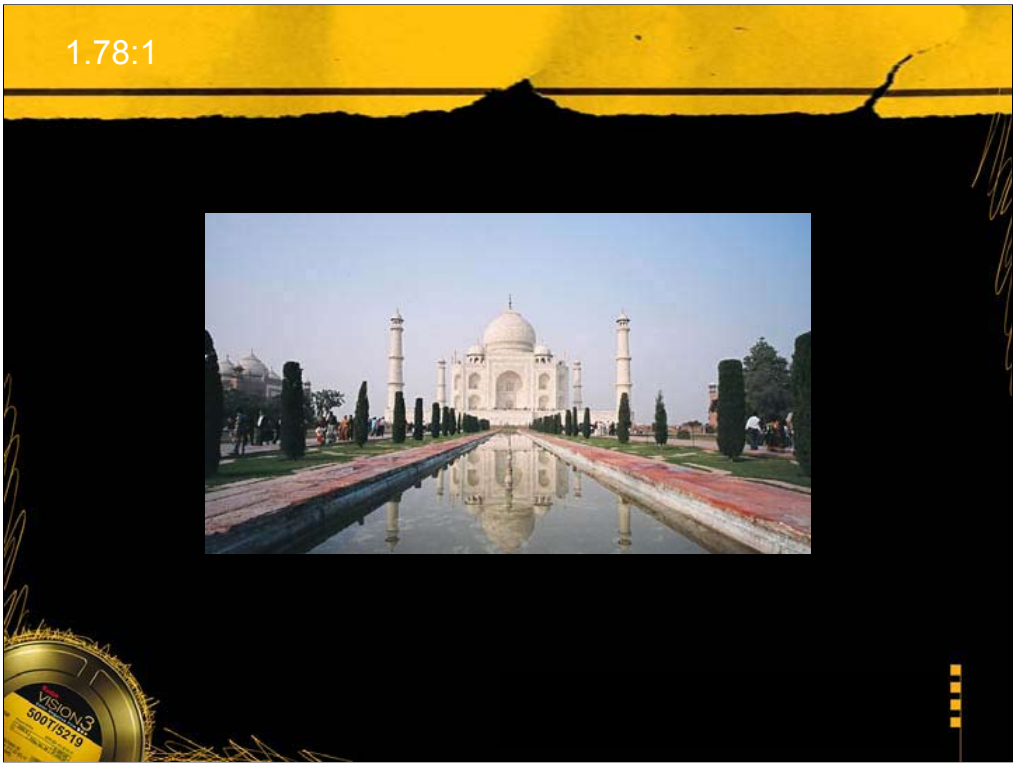
In the United States, there are two aspect ratios commonly used for 35 mm film projection: 1.85:1 (flat) and 2.40:1 (scope). Theater owners who wanted to create a wide screen developed 1.85:1; they did this by cutting off the top and bottom of the 1.37:1 image.



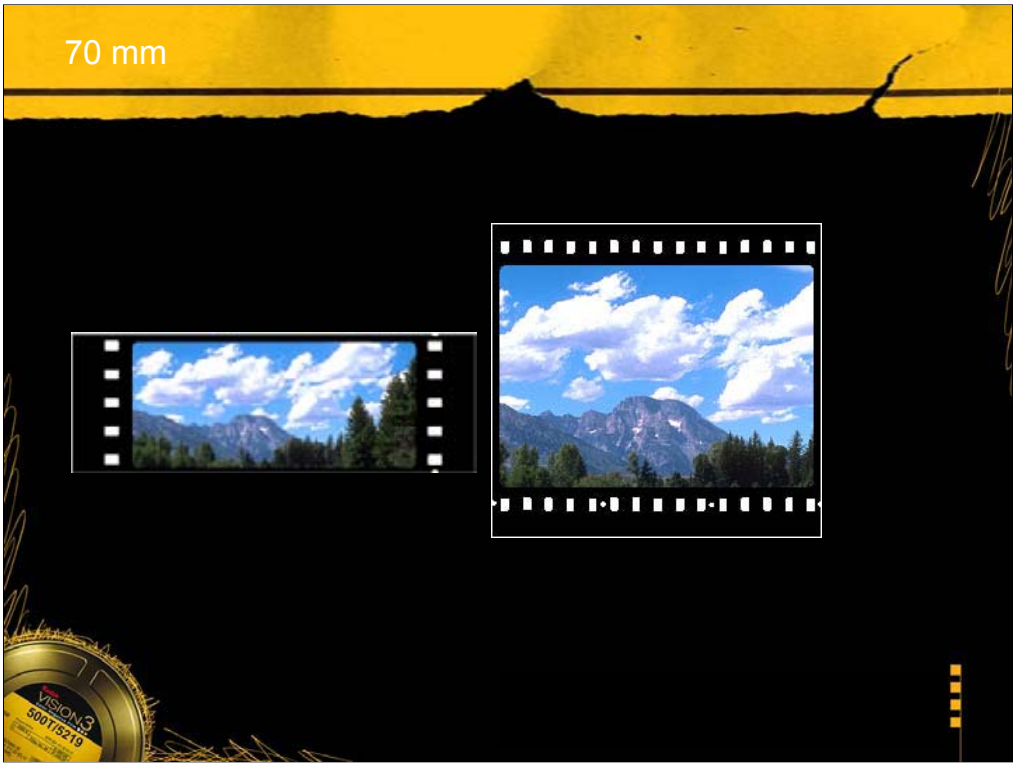
The 2.40:1 image was developed from the 2.35:1 CINEMASCOPE System. Special anamorphic camera lenses are used to squeeze the image during capture. A similar lens is used to expand or un-squeeze the image during projection. The original 2.35:1 image was later modified to 2.40:1.



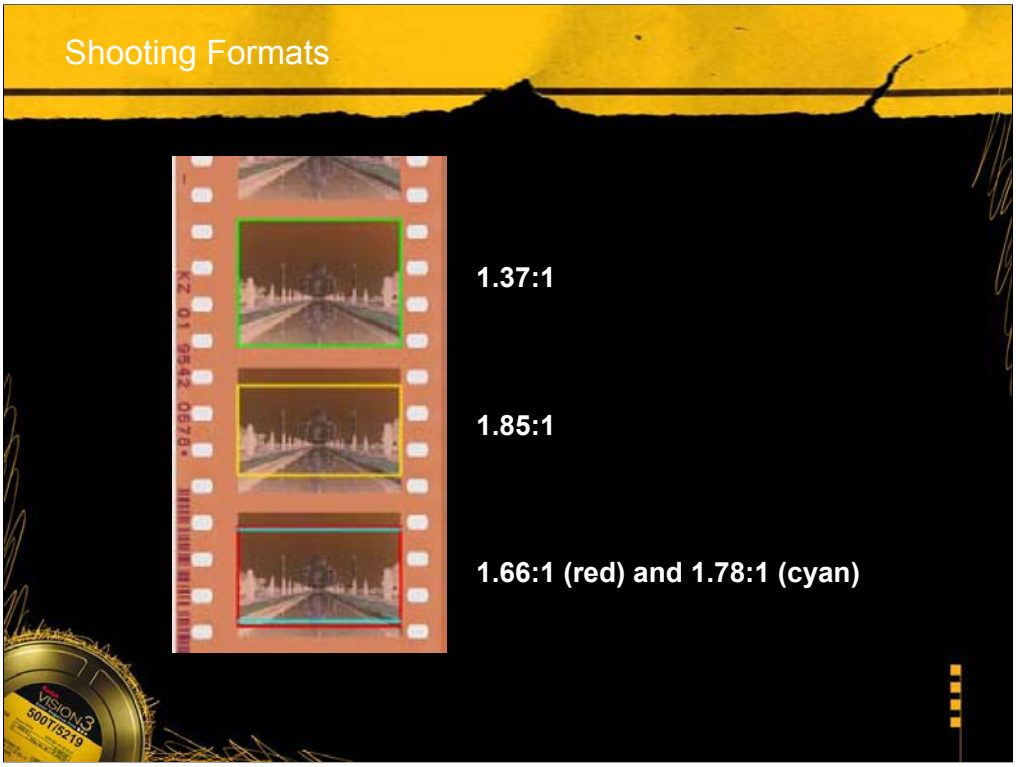
A common aspect ratio in Europe is 1.66:1, the native aspect ratio of Super 16. This is because many films shot in Europe were shot on Super 16 and then blown up to a 35 mm print.



The 1.66:1 ratio is very similar to the current standard for HDTV, 1.78:1 or 16x9.

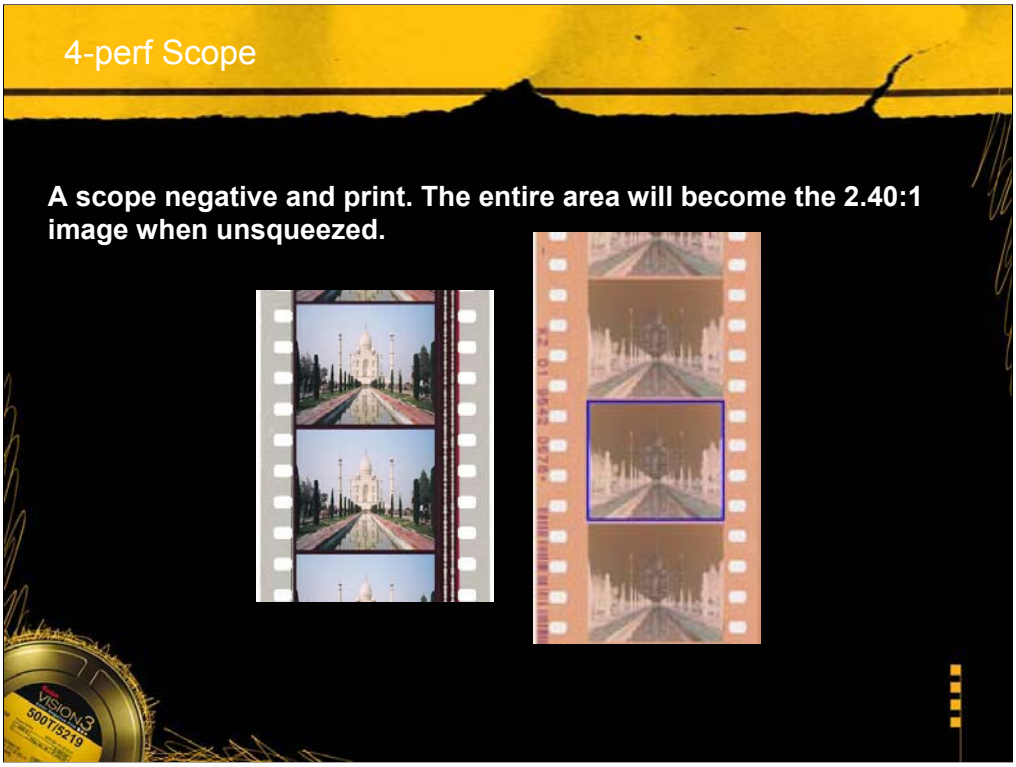


Two 70 mm formats are also in current use. 70 mm wide at 2.2:1 and IMAX, which is 1.43:1. Both are projected onto much larger screens than 35 mm formats.

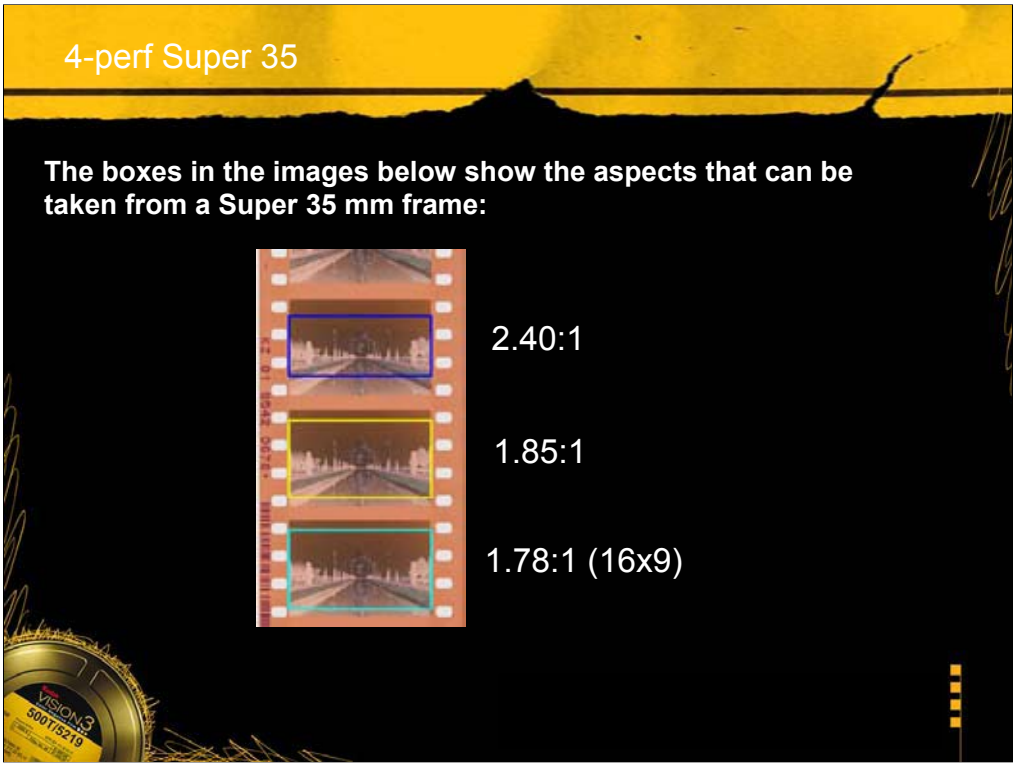


The most common shooting format is 4-perf 35 mm. Feature films with aspect ratios of 1.85:1 and television programs may use this format. The cinematographer frames for the final aspect ratio, and that part of the image is used for electronic transfer to video or projection in theaters.

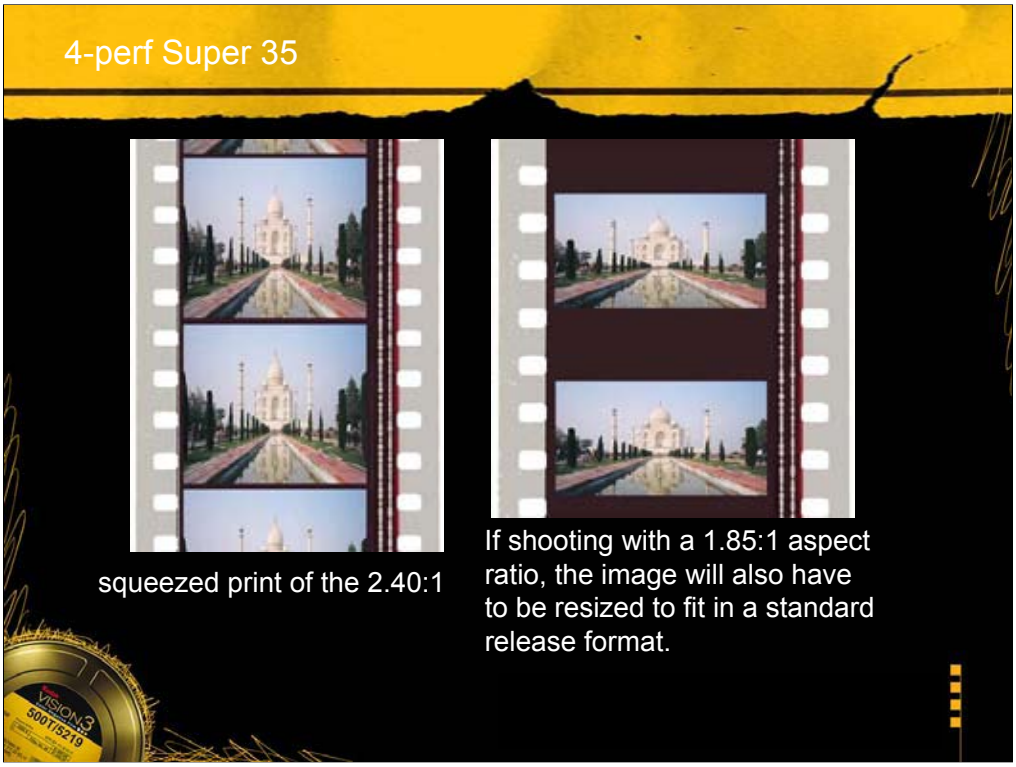
The boxes in this image show the different aspect ratios that can be extracted from the 4 perf frame. In green 1.37:1 (4x3), in yellow 1.85:1, in red 1.66:1, and in cyan 1.78:1 (16x9).



With 4-perf scope the image is photographed through special lenses that squeeze the image. The image is then “unsqueezed” during projection.



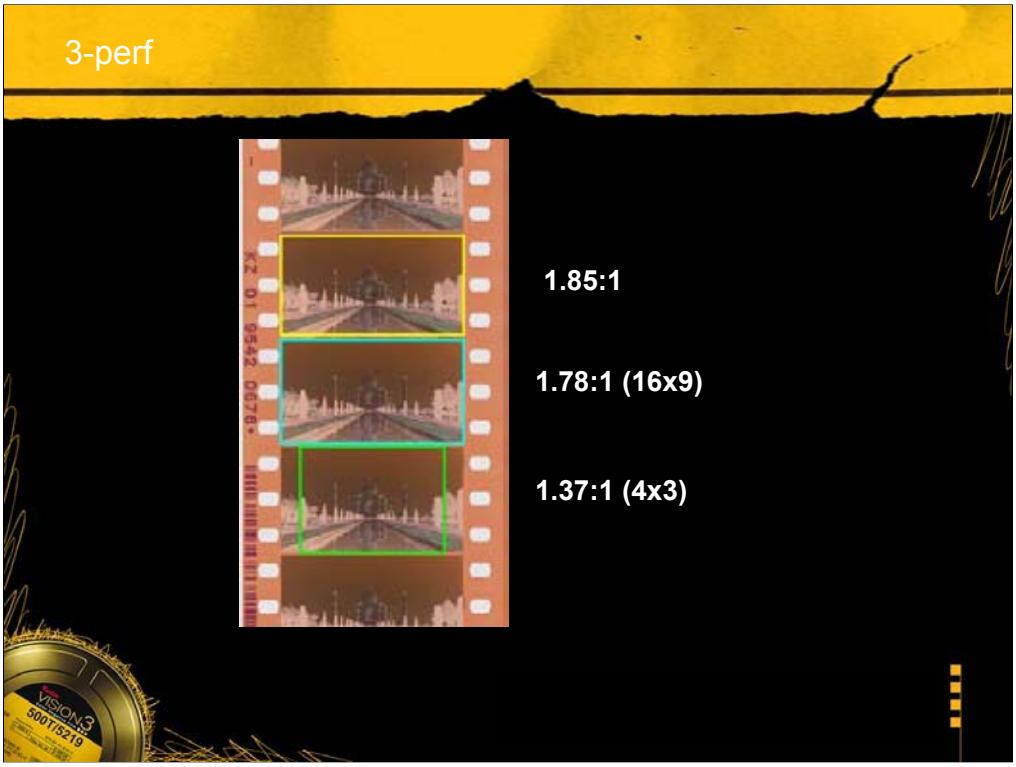
Super 35 uses the whole frame of film, including the space usually reserved for the soundtrack. From this full frame, a 2.40:1 extraction is made in the intermediate process, optically or digitally, to produce a squeezed negative for printing.



On the left, this is what the squeezed print of the 2.40:1 would look like.

And on the right:

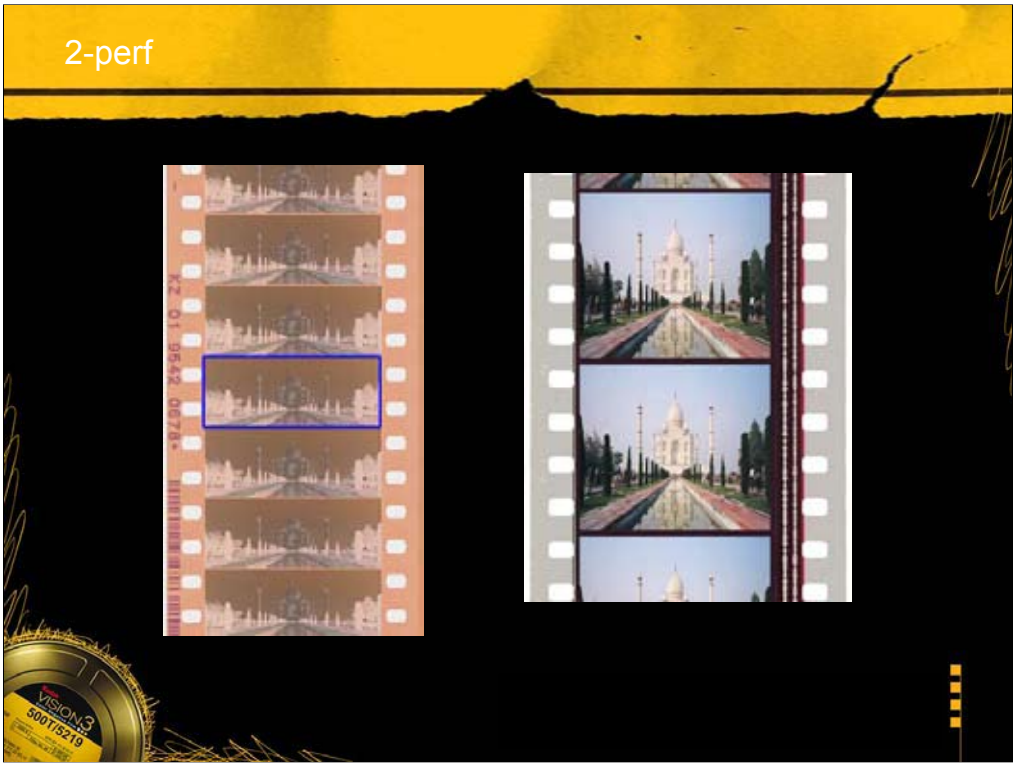
If shooting with a 1.85:1 aspect ratio, the image will also have to be resized to fit in a standard release format.



The 3-perf format was originally developed for television. Advancing the negative 3 perfs at a time instead of 4 eliminated the extra space between frames. That extra space had been helpful in splicing 35 mm negatives together, but such splicing is seldom used in television production. It was once impractical for feature films but digital intermediates have made this a viable format for feature films.

The boxes in this image show the aspect ratios that can be taken from 3-perf. In yellow 1.85:1, in cyan 1.78:1 (16x9), and in green 1.37:1 (4x3).

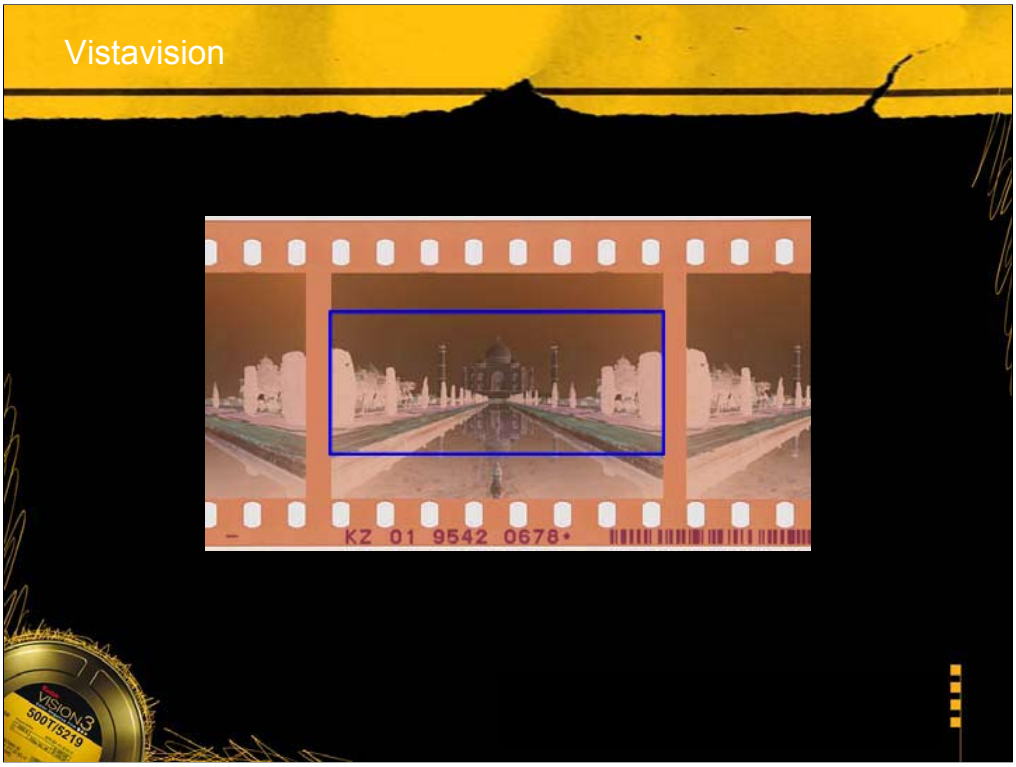
Note that in the 1.37:1 frame, the lines are centered, but some camera systems may be centered on a different part of the frame.



This format is similar to 3-perf , but the camera pulls down 2 perfs instead of 3.

2-perf is used to create a 2.40:1 image with a minimum amount of film. Like Super 35, the image must be digitally or optically enlarged to a 4-perf animorphic intermediate/negative. This process was once called TECHNISCOPE.

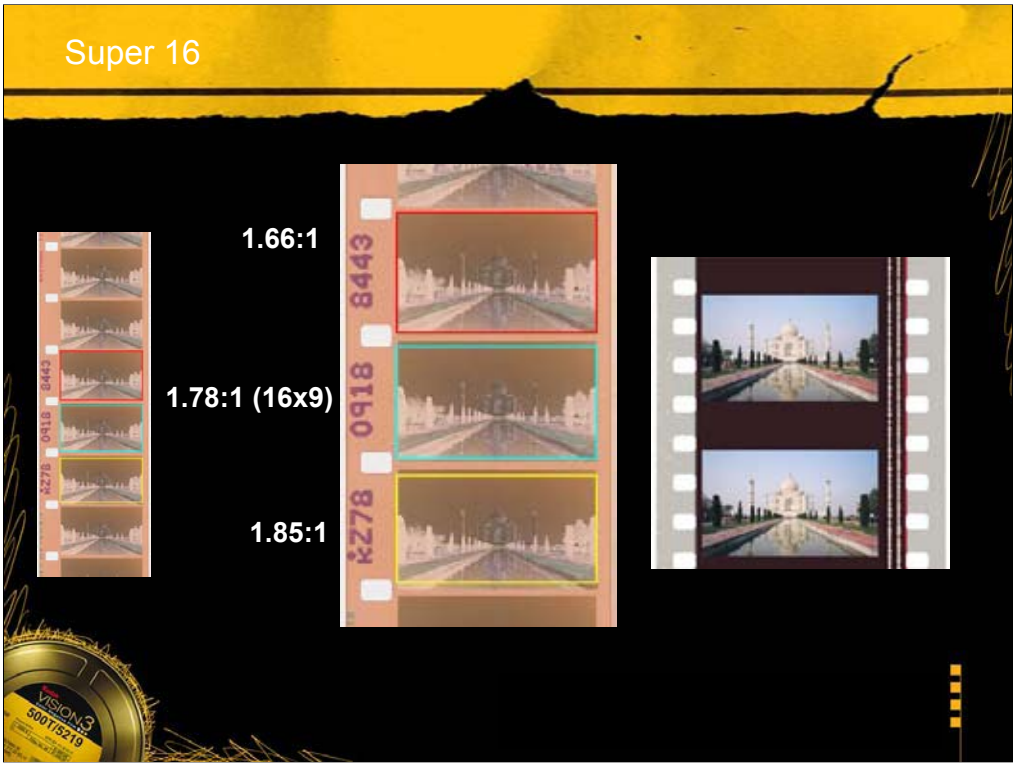
On the left, the 2.40:1 aspect ratio is outlined in blue. This image must be squeezed optically or digitally into a CINEMASCOPE frame (on right) just like Super 35 2.40:1.



VISTAVISION is a 35 mm horizontal format with an eight-perforation pull down (across), which was typically used with high quality background plates in special effects work. The camera aperture is approximately 1.5:1 (37.7 x 25.2 mm).

The 2.40:1 frame is outlined in blue above but VISTAVISION format is primarily used for special effects and not entire films.

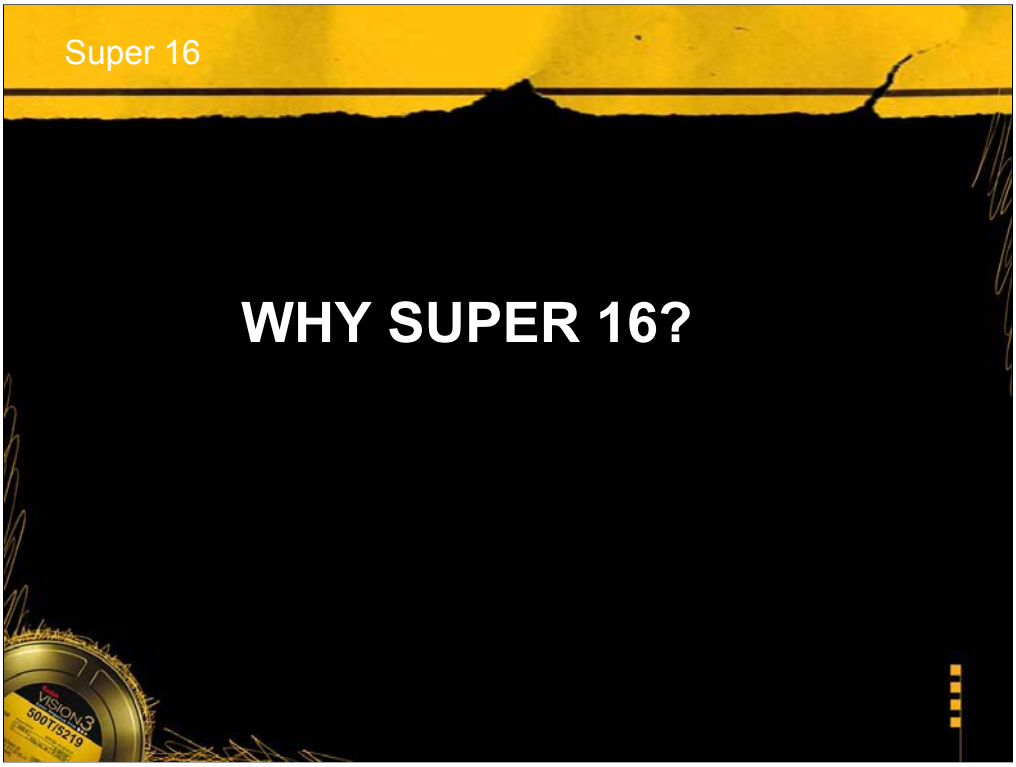
A hard matte can be used in the camera or applied when printing optically or outputting digitally. It will mask the image area that is not being used.



The image resulting from Super 16 is the same height as standard 16 mm, but the image extends into the perforation area. The native aspect ratio of Super 16 is 1:1.66, which is nearly identical to HDTV (1:1.78). When Super 16 is blown up to 35 mm, an aspect ratio of 1:1.85 is usually taken from it.

Super 16 is currently the most common shooting format for many independent films, television productions, advertising, music videos, and documentaries.

On the left is a 16 mm strip with the common aspect ratios outlined: 1.66:1 in red, 1.78:1 (16x9) in cyan, and 1.85:1 in yellow. In the center is an enlargement of the frames and to the right is a print of the blown up image.

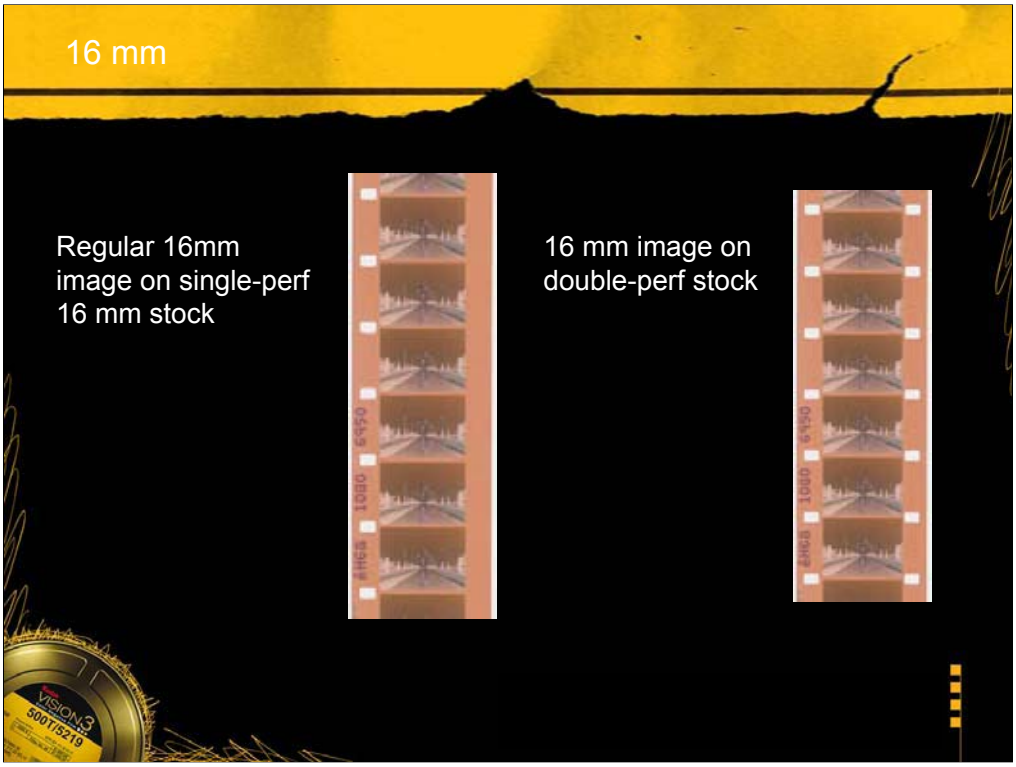


Super 16 costs less than 35 mm origination, yet it maintains comparable quality and resolution overall. It's appropriate for a variety of distribution formats, including large screen releases.

For first-time features, films with a small budget, and films with a limited theatrical run, Super 16 can be ideal. Established filmmakers such as Mike Figgis (Leaving Las Vegas), Spike Lee (Get On The Bus), or Steve James and Peter Gilbert (Prefontaine) have found Super 16 to be a cost-effective solution.

Worldwide HDTV transmission standards have an established a wide-screen aspect ratio of 16x9 (1.78:1). Originating on film in the 1.66:1 aspect of Super 16 is a means of future-proofing a production investment in order to guard against incompatibility and obsolescence.

Super 16 has been the format of choice for reasons ranging from the resulting Look, the cost-savings, the modest size of equipment packages, and any combination of these. Rugged film cameras are getting smaller and even more portable, as light as 4 ½ lb. (2.4 kg). They're proven in the toughest shooting environments and weather: high humidity, burning sun, snow, dust, and sand.

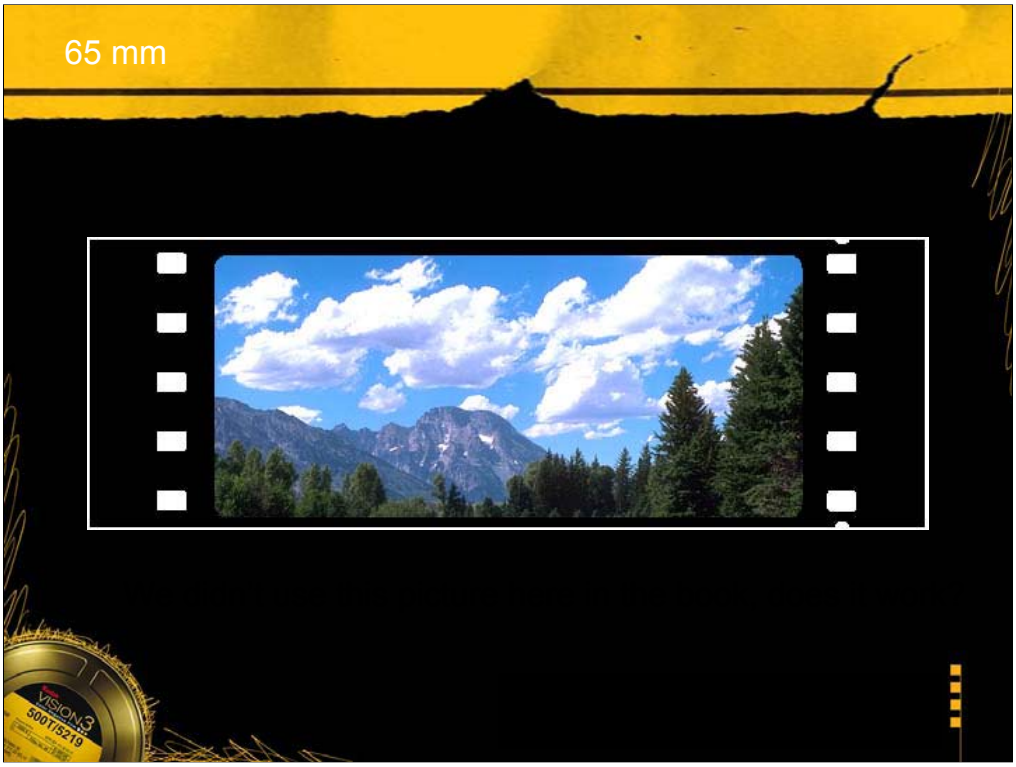


The Standard 16 mm image has the same aspect ratio as the original 35 mm academy format. It's typically used for 4:3 television origination. The image is symmetrical on the centerline, and the area to the right on single-perf print stock can be used for an optical soundtrack.

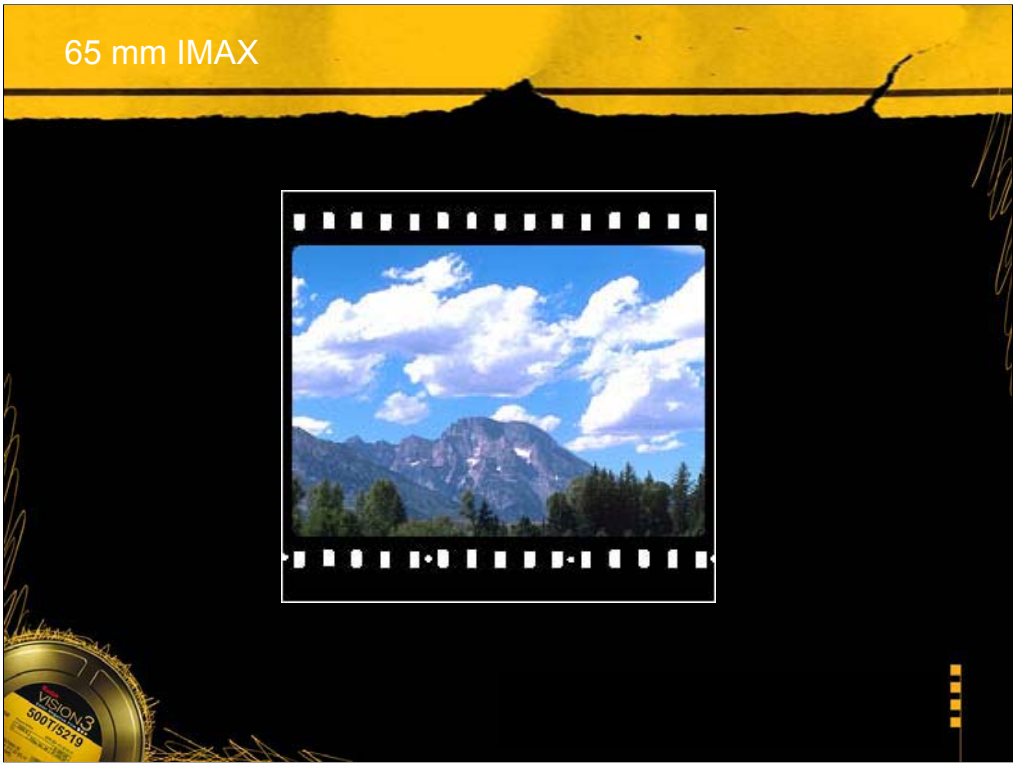
Almost all 16 mm cameras can be used with single-perf fim. Double-perf stock is also available, but is typically used for shooting with specialized high-speed cameras. It can be used for normal sync shooting, but only in 1.37:1 format (not for Super 16).

Once considered an amateur format, Super 8 is now used for effect in promos, documentaries, and many other applications. It is also used as an effective tool for teaching film. It is supplied in self-contained cartridges.

These are scans of Super 8 film. On the left is a negative and on the right is reversal.



Images made on 65 mm film have a 2.2:1 aspect ratio. Release prints are made on 70 mm print film, this is necessary to accommodate six magnetic sound tracks on the edges of the film. Today a double-system sound system is used with separate CDs having 6-track sound controlled by a time code printed on the film.



IMAX and OMNIMAX productions use 65 and 70 mm film but with a horizontal image and a 15-perforation pull-down (across) for very large-screen shows.

The choice of one stock over another largely determines the texture and mood of an image. The use of multiple film stocks can help to separate different looks within a film. Within the two main categories—daylight (D) and tungsten (T)—stocks are available in a variety of sensitivities and contrast characteristics.

The choice of an appropriate stock is determined by a combination of aesthetic and practical considerations.

Low speed films have a tighter grain structure and produce less texture than faster films. Normally we shoot daylight films in exterior scenes where there is ample light. But it's possible to shoot the faster stocks in the same situation in order to incorporate their textural component.

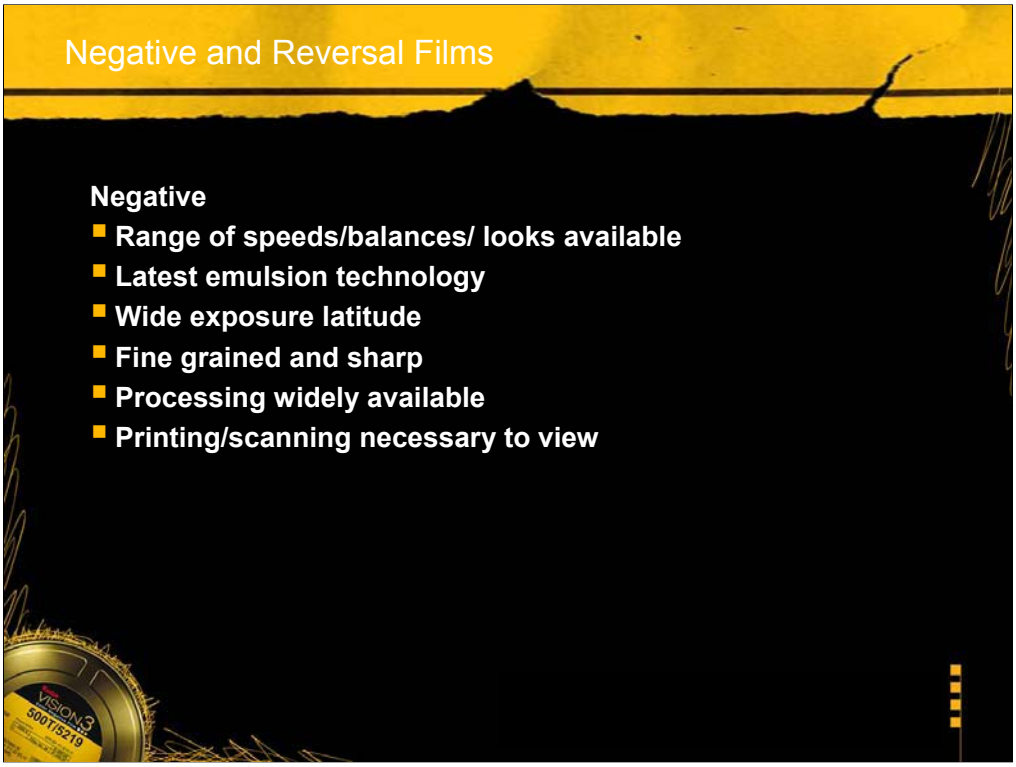
Your scene might take place in a very low-light situation. There is a variety of high-speed films that offer a number of possibilities. You can manipulate slower film to work in the same situation, with even more “Look” options.

Low contrast films tend to see into shadow areas a bit more than the normal stocks. They also possess a softer, less saturated feel. These films are especially helpful in situations where the negative will be transferred or scanned, and the intent is to capture as much tone scale as possible.

Each film can be used in nearly any situation, albeit with significantly

What are Your Shooting Needs?

1. **Where will your film end up? On film, or other electronic or digital format?**
2. **Are you working with daylight or tungsten lighting?**
3. **Unpredictable shooting? Low light conditions?**
4. **Do you need medium speed with better image structure?**
5. **High color saturation?**
6. **Blue screen work?**
7. **Lower contrast, more open shadows, softer look?**



Negative film is available in a range of speeds and color balances, and it offers the latest emulsion technologies. Negative film has wide exposure latitude, is fine-grained and sharp, and processing is widely available. Negative film must be printed or scanned in order to result in a positive image.

Negative and Reversal Films

Reversal

- **Direct positive image**
- **Brilliant saturated colors**
- **Fine grained and sharp**
- **Narrow exposure latitude**

Film Speed

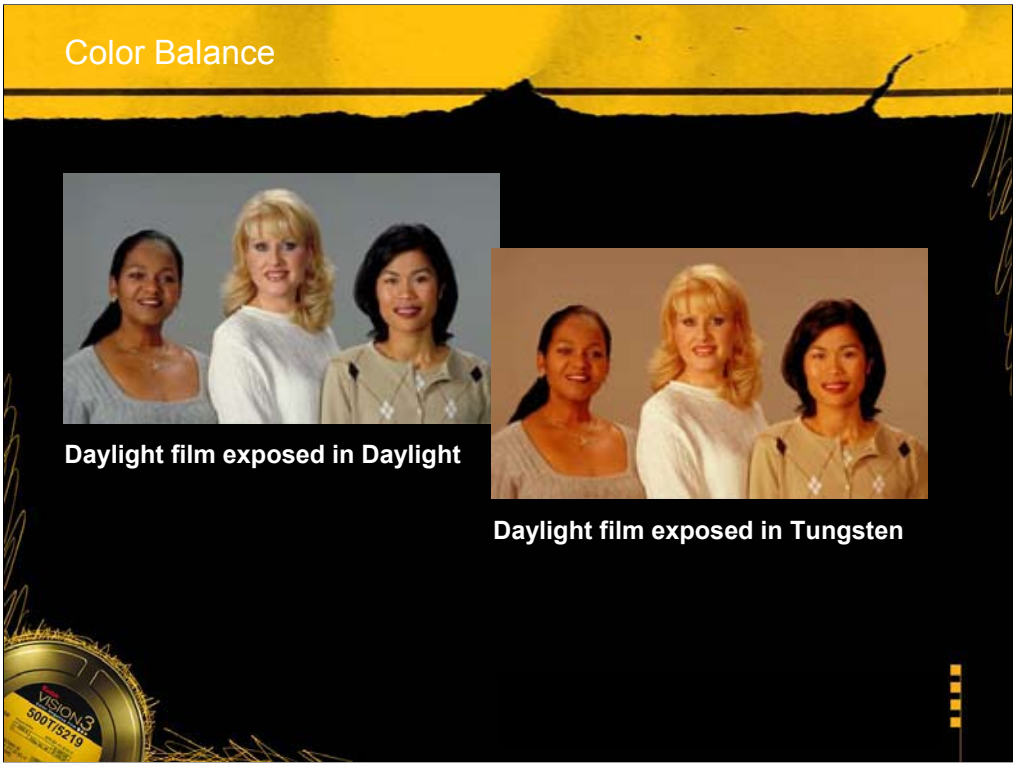
The next choice when selecting your film stock is the exposure index (EI). The film's speed is a measure of its sensitivity to light.

Select an exposure index based on the amount of available light you will have. If you are shooting outside in bright daylight conditions you may wish to shoot an EI 50 stock. If you are shooting with available light or a minimum lighting package, EI 500 would be appropriate.

SIDEBAR

A word about film speeds

You probably know that motion picture films use exposure index (EI) to indicate speed. Although similar, EI is not the same as the ASA or ISO speed used for still films. EI denotes a somewhat conservative figure related to the higher quality requirements of motion picture film that must be projected onto a large screen. Typically the EI speed is about one stop lower than ASA or ISO. EI 500 film, therefore, is the equivalent of ASA/ISO 1000.

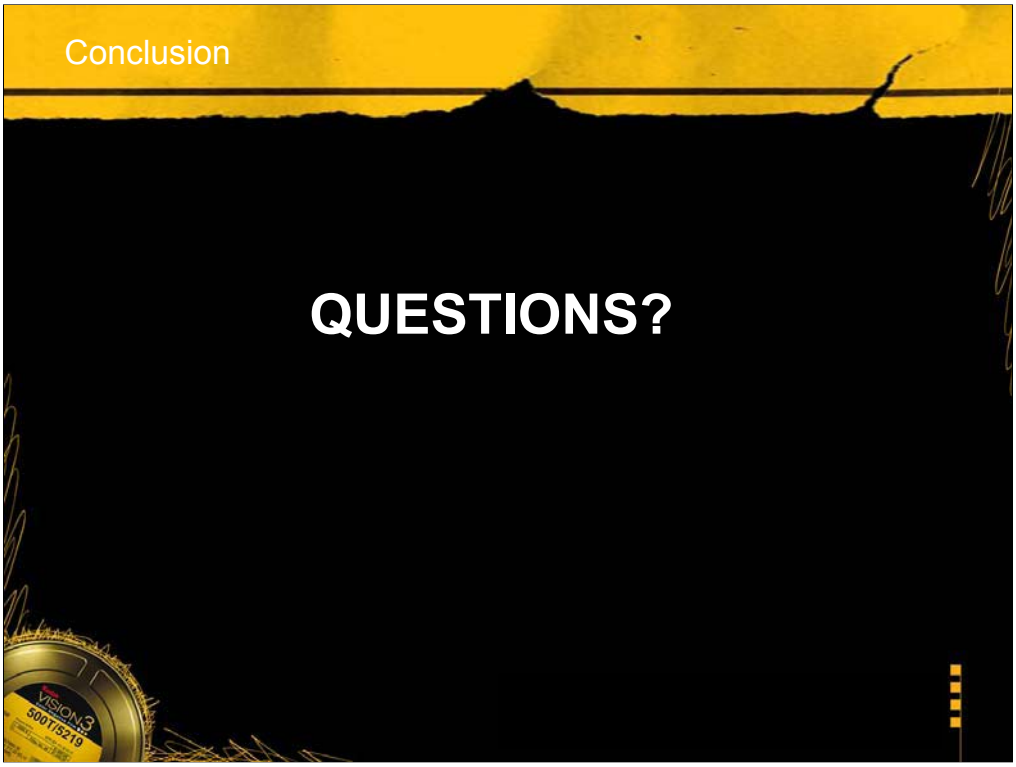


Color Balance

The scenes we see and photograph are illuminated by a variety of different colored light sources. Because the human eye adapts to different colors of light, the scenes all appear neutral—a sort of automatic white balance.

Conversely, film has fixed color sensitivities and does not adapt; different colors of illuminant are reproduced as different color balances.

Films are designed for exposure under tungsten lights or in daylight. Filters can be used on the camera lens to convert these sources or to provide correction—such as for other sources like fluorescent. A tungsten-balanced film can be shot in daylight using a WRATTEN 85 Filter with a speed loss of only 2/3 stop. However, when shooting a daylight-balanced film under tungsten illumination, the speed loss is greater: 2 stops. Additional correction can be applied by the color timer in the lab or the telecine.



This concludes the chapter on Film Types and Formats.