Film-Tech

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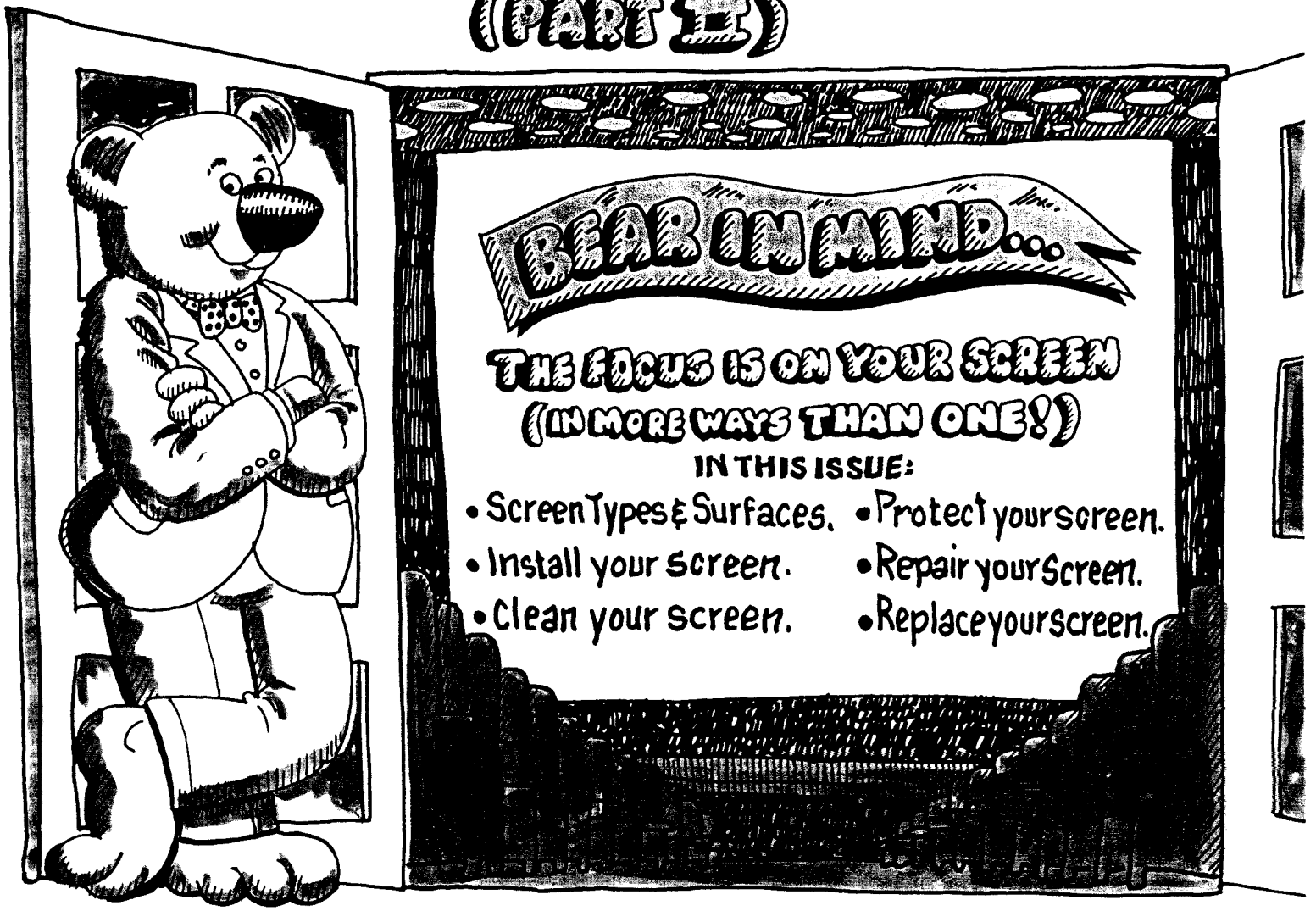
FILM NOTES FOR THE
REEL PEOPLE
H-50-16
A TECHNICAL SERVICE FOR FILMHANDLERS FROM EASTMAN KODAK COMPANY

"KEEP 'EM COMING BACK!" (PART II)



Introduction

As tempting as well-run "concessions" can be—especially when suggestions that have been made earlier in this series are followed—most people seek out a motion picture theatre primarily for the films that it shows. So, as part of our continuing series designed to "Keep 'Em Coming Back," let's consider the focal point of the theatre audience: The Screen.

Every theatre owner and manager wants a sell-out every time. That takes considerably more than simply showing a film the audience wants to see. It means using all the tools that help to ensure quality of presentation. The projection booth may bristle with technically advanced equipment, but the final result can be substandard if the target of the whole projection system, the screen, is not chosen, mounted, and cared for properly.

A proper screen suits the auditorium in its reflective properties, its curvature, and its ongoing maintenance. Although high on the list of priorities when outfitting a theatre, the projection screen is one of the least costly when compared with projection

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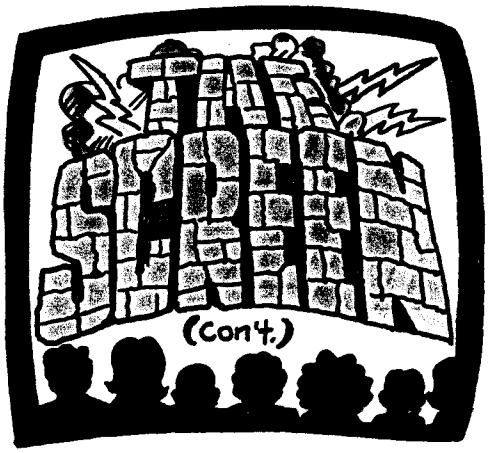


booth equipment. But its importance cannot be overemphasized. Remember: the screen is the only surface intended to be viewed by your patrons the entire time they are in the theatre.

The quality of the screen and its upkeep are major determinants affecting the brightness of the films that you project. Theatres having insufficient light may have to look to the screen instead of the lamphouse for a solution. A new screen or different type of screen may be needed. And, although proprietary systems such as Iscovision and Showscan have been developed to optimize projected light, these processes require equipment that is not commonplace in the majority of theatres at present. Such revolutionary systems are important technologically, however, and will undoubtedly help to pave the way toward more clearly defined images on screens of the near future.

Screen Surfaces and Types

Screen manufacturers offer a wide variety of screens, but specific circumstances determine which type of screen is best for a given auditorium. The factors to consider are the size and shape of the auditorium, the seating configuration, the appropriate lens for that seating arrangement, the cost, and the amount of maintenance required to retain appearances and reflectivity.

Discussions of the reflective capability of a screen often use the term "screen gain." It is defined as the level of reflectivity at a given angle of observation as compared with a universally accepted standard. The current standard seems to be the amount of light reflected by the magnesium carbonate surface of a matte white screen. A reading is usually taken at the center of the screen, very much as it is viewed head-on at a 90-degree perpendicular angle. Depending on the type, a screen can have a "gain" of 1.5 to 2.0 or more times the reflectivity of magnesium carbonate.

No screen manufactures light and, therefore, no screen reflects more light than is projected upon it. But some screens project the available light more efficiently than others—at least, they *seem* to do so, giving the illusion of increasing light.

Matte white screens have highly diffuse properties. They are difficult to illuminate because the matte surface scatters light rays in every direction. But such screens are desirable for several reasons:

1. They may be viewed from wider angles because the light is reflected equally at all points.
2. They offer uniform image and color resolution.
3. Their curvature minimizes falloff at edges, thereby retaining screen edges.
4. They are the least costly to purchase.

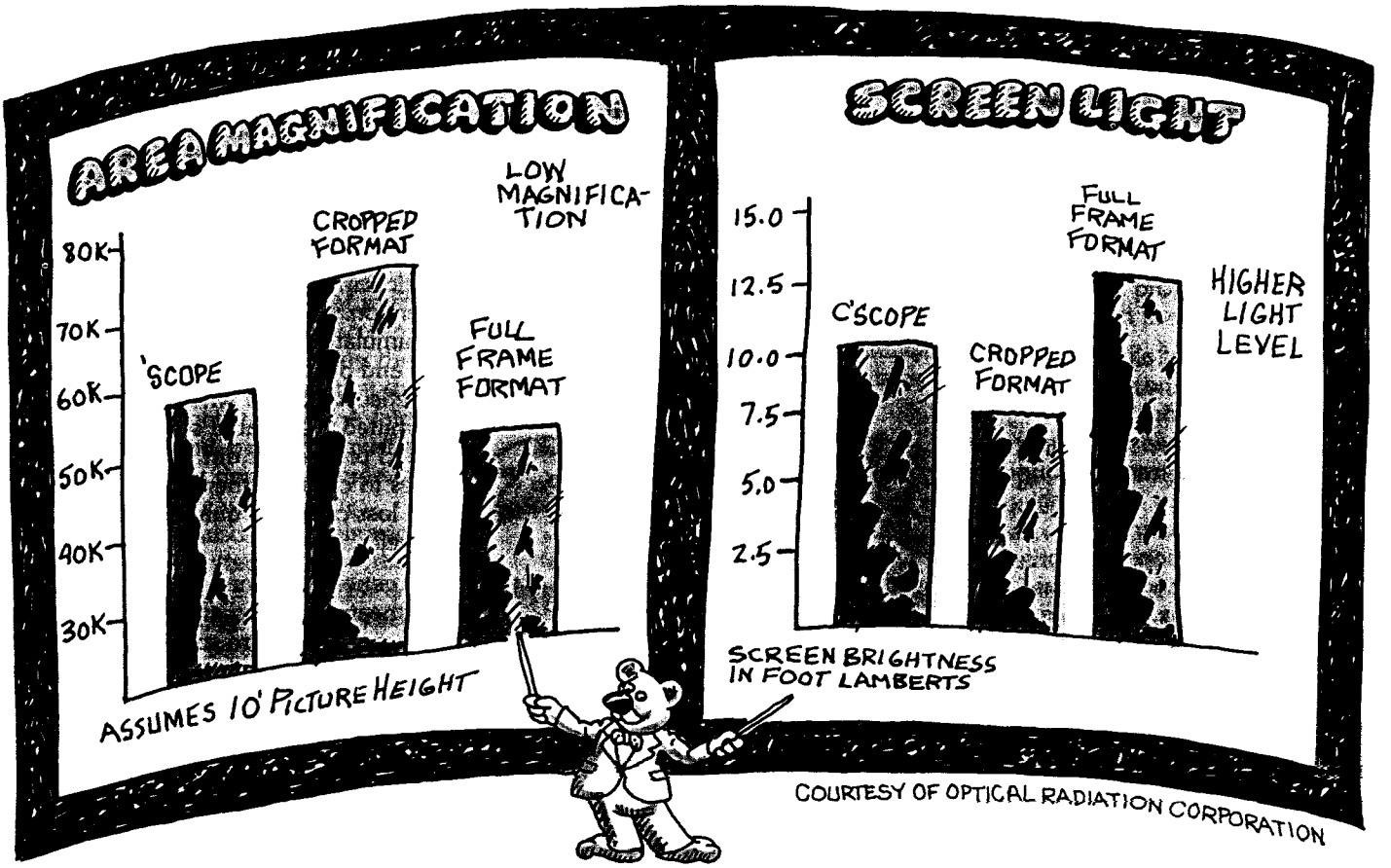
The matte white screen's magnesium carbonate surface is the standard generally used for measuring screen gain; its center gain is considered to be approximately 1.0. However, because the matte screen contains no brightness enhancers, it is necessary to effectively limit all ambient light.

Pearlescent screens are the most frequently used screen today. They are a heavy-duty, smooth, white screen with a translucent coating similar to mother-of-pearl. They are easier than matte white to illuminate properly for a brighter image. Their center gain readings vary from 1.5 to 2.0 depending upon the manufacturer. Because the coating is translucent, the white pigment of the screen material improves the overall brightness or illumination and light distribution of the screen. They also give the picture a sharp, clear image and true color rendition. These factors make pearlescent screens perform well in wider auditoriums. The overall brightness and distribution of light allow viewing angles approaching 60 degrees off center with only slight falloff at the sides.

An increase in screen gain is in direct proportion to the amount of curvature needed to hold falloff to acceptable levels. Pearlescent screens have met with great success in today's multiplexes because of their adaptability to a variety of projection formats often involving wider aspect ratios. Some theatres even attempt to mimic the old "Cinerama" look by moving audiences forward. If this is done, the screen should be curved proportionally to eliminate high falloff levels in the front and along the side walls. According to Glenn Berggren, vice president of marketing, theatre, and audiovisual productions of Optical Radiation in Azusa, California, the only way to make a "gain" screen work perfectly is by curvature.*

Lenticular screens, one general type of screen that we have not yet mentioned, are made up of tiny cup-like depressions covering the screen. There are several purposes behind this type of screen design. Flat lenticular screens tend to reduce the loss of reflected light to the side walls, ceiling, and floor and to concentrate the light in the area occupied by the audience. Curved lenticular screens reduce cross-reflection, thus eliminating washout at the sides.

*Glenn Berggren, "On Optimizing Screen Curvature in a Front-Projection Indoor Theatre," *SMPTE Journal*, Vol. 76.



Iscovision Process: Concentrates the light on the screen so that it is brighter. It also concentrates the film image into an existing screen size with less overall magnification.

Again according to Glenn Berggren of Optical Radiation in Azusa, California, the ideal application for projection would consist of a mirrored screen which would, because of its surface, reflect every ray that struck it. This screen would be curved by being placed in a sphere so that not only the sides would deflect ambient light, but the corners would curve inward to do the same.

Few of today's theatres can afford this ideal system. Any theatre management can, however, benefit greatly when it assures maximum acceptable seating area, based on highly efficient light distribution and highly reflective screen materials aided by proper screen curvature.

Exactly how much light should a theatre screen reflect? A national standard (ANSI PH22.196-1978*) has been set for indoor theatres, and a service technician can check it with a meter.

*American National Standards Institute, *"Screen luminance and viewing conditions for indoor theatre projection of motion picture prints."*

Measurements of the geometric screen center should be between 14 and 18 footlamberts (55 ± 7 cd/m^2). Readings at the side of the screen must achieve a minimum of 10 footlamberts (34 cd/m^2). If the tests fall below these levels, corrections should be made.

Silver screens are high-gain screens. Their center gain readings vary from 2.0 to 2.6, and the image is very bright when viewed head-on. They are easily illuminated because of their highly directional ray reflection, which however may be viewed only from a limited seating area unless the screen is properly curved, because most of the light is reflected within 30 degrees of the center. If the screen is flat, people seated outside this 30-degree area experience difficulties seeing the screen on the side opposite them. An uncurved silver screen should be used in a long, narrow auditorium where its success depends upon being able to group the audience toward the center of the reflective pattern. The high initial brightness of a silver screen helps to combat considerable ambient light and thus in many cases prevents the image from being washed out.

Curved screens offer the advantage of reducing or eliminating problems inherent with high-gain screens. It is essential to balance the diffusion properties of a screen material against the application requirements.

Ideally, an engineer specializing in physics, optics, and visual perception should be intensely involved with the theatre architect when the auditorium design and pitch are still in the formative stages, especially if the brightest picture and depth of image detail available are desired. While the silver screen can deliver these qualities, its highly directional reflecting pattern must be contained. This is best accomplished through screen curvature that is constructed relative to the seating area. Carefully engineered curvature also minimizes light radiated to ceilings, walls, and floors.

Because of its directional light distribution pattern, a silver or aluminized screen is the only surface approved for showing 3-D and other processes calling for highly polarized light.

Perforated screens reduce reflectivity by 15-20%.

Perforated screens of all types are available to enhance the sound portion of a projected film. Considerable research has determined the proper type of perforation to transmit sound most effectively without detracting from the quality of the image. Although the perforations are not visible from most seating positions, viewers seated close to the screen may be able to discern the perforation pattern. Therefore, in cases in which screen and audience size are small, nonperforated screens should be used.

Install Your Screen

Once the proper screen surface has been determined, attention must be given to installation. Most theatre equipment dealers install their own screens or arrange for an experienced installer to do it. Most screens are made of nonsupported vinyl materials that require tension on all four sides to be properly hung. They must be stretched free of all wrinkles and indentations because the slightest wave in the fabric distorts the picture by altering the reflective pattern.

Screens are generally installed in one of three ways: suspended in curved or linear frames, mounted in frames against drywall or wood, or suspended from hooks or nails positioned in grommets.

In many cases, once the screen is selected and installed, it is neglected. But one of the keys to keeping a quality picture is maintaining the screen. The most obvious offenders in some neighborhood multiplexes are spitballs. They are usually wet when they hit the screen. After they dry, it is simple to flick them off by using a feather duster or a soft, dry brush. One ingenious theatre manager we know significantly decreased the number of spitballs by eliminating the wrappers on straws at the concession stand.

- Paint frame parts of perforated screens with flat black paint to prevent reflection.
- Coat lumber with fire-retardant paint.
- Mask the frame.
- Align screen and projector for proper picture dimension, angle of projection, and focus.

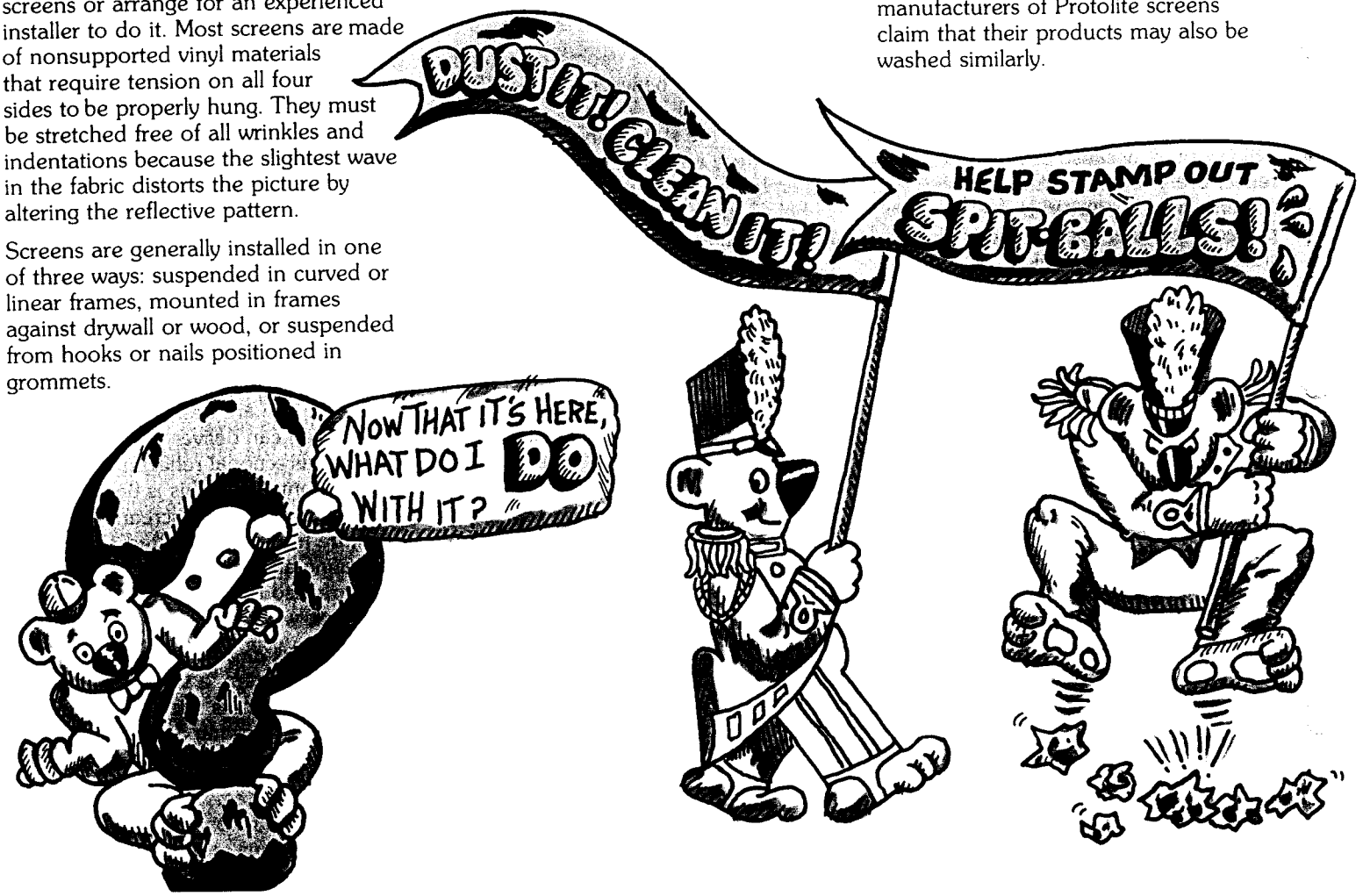
Clean Your Screen

Part of weekly janitorial maintenance should be dusting the screen—the whole screen, not just the lower half—with a feather duster. If only a portion of a screen is dusted or cleaned, in time a demarcation line where the dusting stopped will be noticeable.

Theatres that allow smoking are particularly in need of constant attention. Even the best screens rapidly accumulate smoke particles and other dirt and dust that cause a severe loss of reflective power when smoking is permitted. Perforated screens have the added problem of dirt clogging the holes to cause further unsightliness and loss of sound quality and volume as well.

The general external environment of the theatre will also affect the aging process of a theatre screen. For instance, a screen that is located in a highly industrial area ages faster than a screen in a relatively rural or residential area.

The reflective coating on most pearlescent and silver screens is severely damaged if any liquid comes into contact with them. A matte white screen, however, may be washed with a mild soap and warm water. The manufacturers of Protolite screens claim that their products may also be washed similarly.

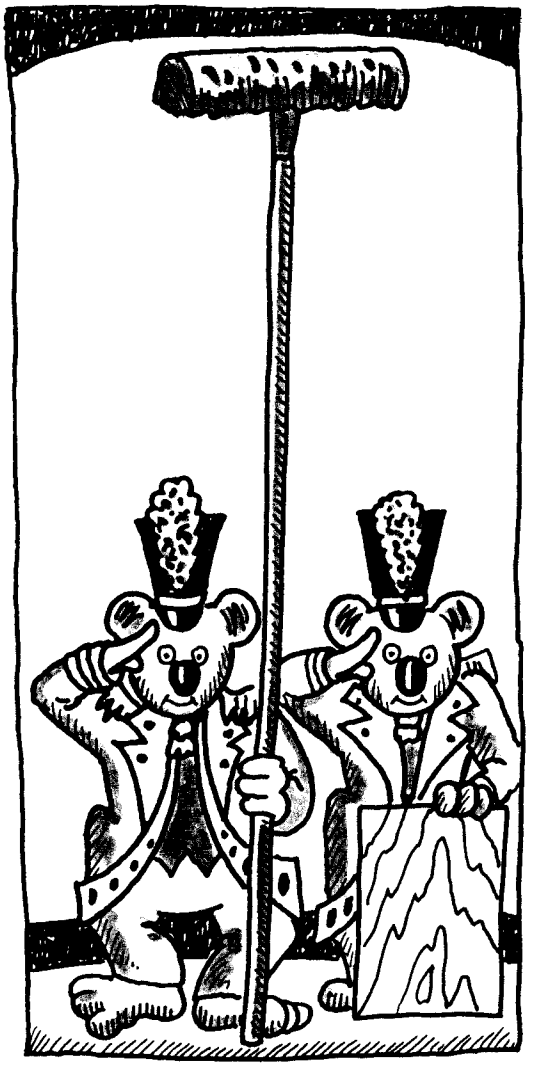


J. F. Craig, president of United Screen Clean of Oakland, California, has developed a chemical process for cleaning theatre screens while in place. The firm's products are available for use by theatre maintenance personnel, or by United's professional service personnel on a per-square-foot basis.

The biggest problem when washing a screen is to maintain uniformity across the entire surface. It requires at least two people to wash an entire screen—one to wash and one to back up the area with a piece of wood so that the screen does not get stretched. A fairly wet sponge is used, but water must be kept from running down the screen to streak adjacent areas. A dabbing, sponging motion also avoids abrasion. The wet area is blotted with absorbent cloth or toweling and the process is repeated. Depending upon the screen size, cleaning can be an all-day project! The board supporting the back of the screen should be wiped between applications to prevent excessive liquid running down the back of the screen and out the lower perforations. REMEMBER: YOU MUST WASH THE ENTIRE SCREEN—NOT JUST CERTAIN AREAS!

Each manufacturer has his own recommendations for properly cleaning pearlescent and most silver screens. If the screen is perforated, start from the back and carefully remove dust from the holes to avoid clogging the perforations or having debris fall through onto the screen's front surface. Be careful not to exert any pressure on the screen material itself.

When cleaning the front of the screen, use a screen brush specifically designed with wide, soft bristles that will not mar or scratch the surface of the screen. Such a brush is available from an equipment dealer or screen manufacturer. The brush also has a screw-type socket for use with a long extension handle to reach the upper part of the screen. Start at the top and use long, even motions so that all areas of the screen are cleaned the same way. It is not nearly as obvious that a screen remains slightly dirty (overall) as it is that it has one area cleaned better than another.



Repair Your Screen

When considering repair of a torn or snagged screen, remember that although a projection screen can be "healed," the spot will always show the relative skill of the repairer.

According to Marshall E. Stewart, president of Stewart Filmscreen Company in Torrance, California, the most difficult repair is a surface scratch that removed the reflective coating on a silver or pearlescent screen. Careful application of aluminum lacquer similar to the original coating or a pearlescent lacquer equal in brightness to the original can reduce the damage. A fairly stiff brush is used to apply the lacquer with a stippling method.

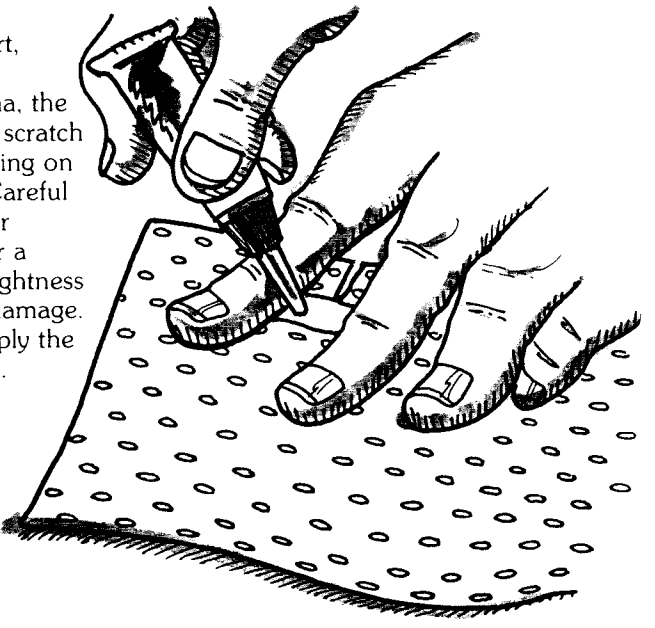
During installation, the optical coating of the projection surface can be damaged if bumped or struck by a sharp object. Usually the vinyl coating is lifted but can be carefully pressed back into place and secured with the proper clear cement, using the smallest amount of cement necessary for good adhesion. The repair will not return the screen to its original condition, but it will prevent projected light from going through the damaged area.

Similarly, a tear in a vinyl screen can be repaired with one of the high quality clear vinyl adhesives available from hardware stores and hobby shops. (Short strips of masking tape should be used on the back of the screen to pull the damaged edges together. The glue is then applied to the mated torn edges between the masking tape, being sure to keep the glue from getting onto the viewing side of the screen.) After the glue has set, the masking tape is removed and glue is applied to that area.

A hair dryer or similar heat source can be used to soften the vinyl screen material to help align the torn edges.

Too much tension on a bound and grommeted screen will cause the repaired spot to tear. After repair, the rehung screen should have only enough tension to hold it in place and keep it flat.

Make sure there is no obstruction near the roller screen that could snag the edges. This could be the source of a tear.



Protect Your Screen

One point to consider in the initial planning stages of a theatre is the location of the heating and air conditioning ducts with respect to the screen. Air blowing directly on the screen should be avoided if possible, because vinyl is easily affected by temperature. Nor should ducts be placed behind the screen. If the screen is perforated, the moving air causes the screen to act as a large air filter, trapping dust and dirt in the perforations.

If, unfortunately, an egg is thrown at the screen, let it dry and then, much as with spitballs, gently flake it off. Never use any type of abrasive cleanser for cleaning any type of screen!

Employee awareness can go a long way toward warding off permanent stains. For example, if a patron hurls a soft drink at the screen, the liquid can be removed quite simply with a soft cloth, if it is still wet. Well-trained ushers can inspect the screen for such mishaps while they are cleaning the auditorium and checking the exit doors between performances.

The importance of having curtains that are cued to close at the conclusion of a presenation cannot be overemphasized. Removal of that "big white target" from view as customers leave the theatre eliminates a great temptation. Furthermore, if the screen is exposed only when the film is being projected, the amount of surface dust allowed to accumulate from day to day is significantly reduced. Although a curtain represents an expense for the exhibitor, savings from prolonged screen life may make the investment well worthwhile.

Replace Your Screen
(Only When Necessary)

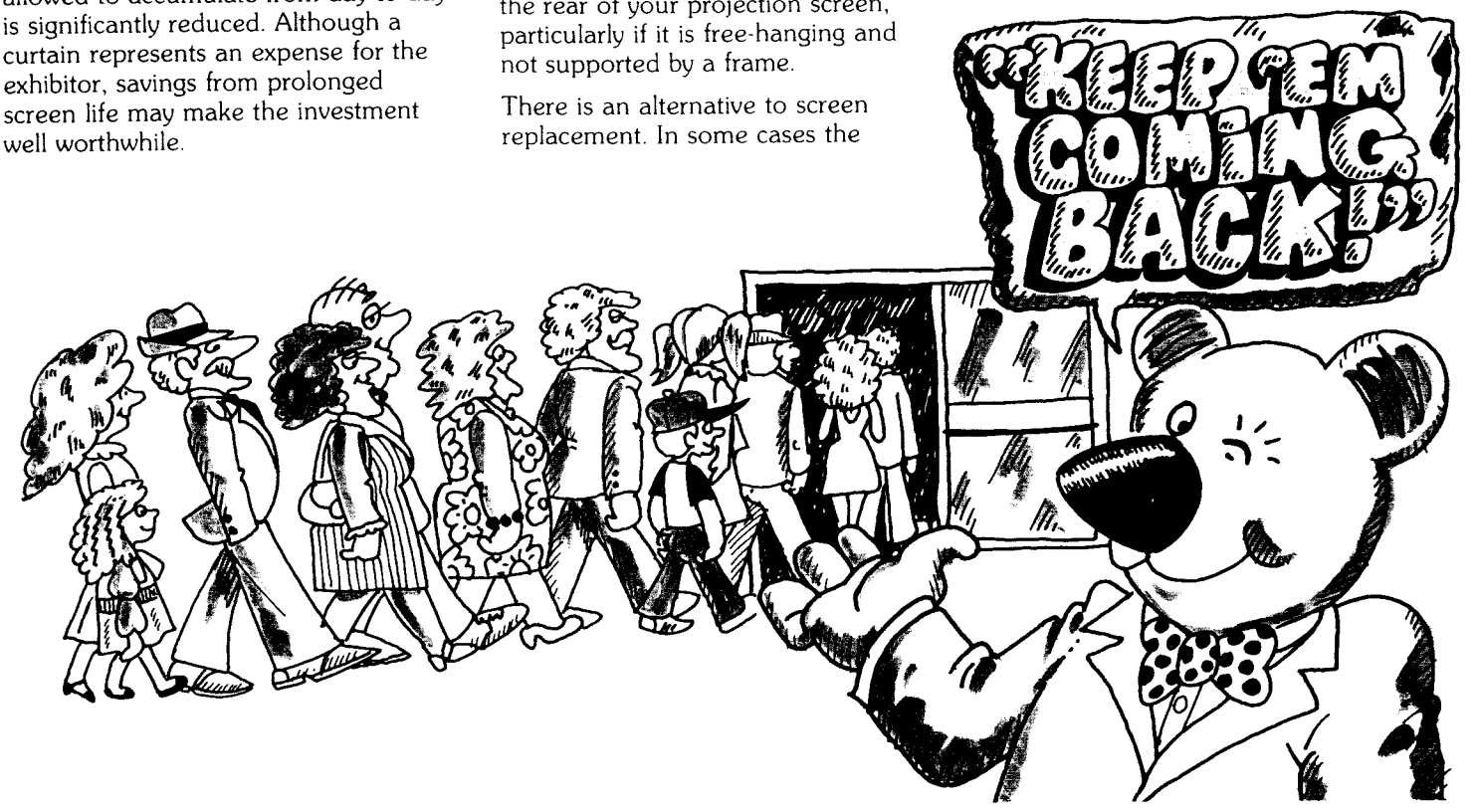
Even with proper maintenance, over a period of time the reflectivity of the screen decreases and the condition of the material deteriorates. Screen brightness should be constantly monitored with a light meter of the "spot" rather than "averaging" type. Such a meter focuses on a specific small target area rather than taking a reading from everything in front of it. Comparing current readings with readings taken when the screen is first installed can determine approximately what the decrease in efficiency has been. After a few years of use, some screens lose from 30 to 50 percent of their original reflective power. In many cases cleaning the screen sufficiently improves the reflective ability of the screen. Eventually, however, the screen has to be replaced. Economic considerations obviously must be measured. Screen cost is, however, one of the least expensive items in the overall projection system.

Some types of screen damage fall directly under the control of the theatre manager. Behind-screen storage for cleaning equipment, concession boxes and drink tanks, and marquee paraphernalia and the like is not a problem—unless those items are allowed to come into contact with the screen. Because screens are vinyl, any protrusion may cause a permanent crease or even a tear in the surface. Nothing should come in contact with the rear of your projection screen, particularly if it is free-hanging and not supported by a frame.

There is an alternative to screen replacement. In some cases the existing screen can be resurfaced or painted (check with your screen service company for qualified contractors, schedules, and other details) . Although the vinyl tends to lose much of its elasticity over time, painting can solve the problem of a stained screen if it has not become so advanced in the aging process that it has cracked. The resurfacing process should be undertaken only by skilled professionals, because the screen must end up completely uniform in reflectivity. Therefore, any streaking or uneven coating is unacceptable. It is difficult even under optimum circumstances to duplicate the reflective and diffusive properties of the original screen.

Because of the wide variety of screens available to today's theatre owner and manager, the proper screen can vary significantly from one auditorium to another. Although the screen is relatively inexpensive when compared to other items in the projection system, its importance to successful presentation cannot be stressed enough. It is the focal point for all your patrons. The wrong screen for your theatre results in poor picture quality and unsatisfied customers. And neglect of your screen shortens its useful life.

Proper selection and maintenance of theatre screens are essential steps toward achieving our fervent desire to "Keep 'Em Coming Back."



LEXICON

Ambient Light:
All light from sources other than the projector (sometimes called stray light in a theatre). Examples: open doors or windows, exit or house lights, etc.

Anamorphic:
A lens or lens system that produces images having different horizontal and vertical scales of reproduction. A lens that spreads the projected image horizontally to provide a wide-screen picture format.

Aspect Ratio:
Ratio of image width to image height. Examples range from the current TV format of 1.33:1 through the original Cinemascope format of 2.55:1.

Candela:
Unit of intensity of a light source. Originally referred to the illumination at a given distance by a standard candle. This has been replaced by a sophisticated physical standard which is "1/60 the intensity of square centimeter of a blackbody radiator at the freezing point of platinum" and, as such, is rarely used. Common working substitutes are carefully calibrated tungsten lamps.

Candlepower:
The luminous intensity of a light source as expressed in candelas.

Cinemascope:
The first commercially successful anamorphic presentation for wide-screen pictures coupled with stereo sound. (Commonly referred to as a "scope" presentation, the image is horizontally compressed approximately 2X.)

Cropping:
To change the size (and ultimately, the aspect ratio) of an image being projected.

Diffusion:
The process of scattering light (by reflecting the incident light equally in all directions).

Falloff:
Substantial loss of image at the sides of a screen.

Footcandle:
The unit of illuminance equal to that received by a point on a curved surface, all points of which are 1 foot from a point source of light with an intensity of one candle.

Footlambert:
The amount of light per unit area reflected from the screen.

Lenticular:
Having lenticules, which are tiny cup-like depressions, over the entire screen surface. Serves to concentrate reflected light to a limited area and eliminate cross-reflection in curved screens.

Lumen:
The unit of measurement for the rate at which light is emitted or received. One lumen is the luminous flux, or light flow, that falls on 1 square foot of surface 1 foot away from a point source of 1 candle power.

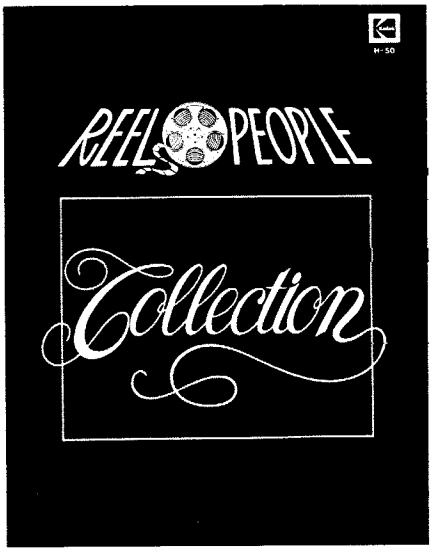
Luminance:
Also referred to as brightness. The luminous intensity (illuminance) of a light source in relation to its area. Expressed in candles (or candelas) per square foot or per square metre.

Reflectivity:
1. Overall reflectivity—the total light reflected by a surface divided by the total light falling on the surface.
2. Apparent reflectivity—the luminance in footlamberts divided by the intensity of light falling on the screen in foot candles. This will approach the overall reflectivity only for diffuse surfaces but otherwise varies with the directional properties of the surface.

Screen Gain:
The luminance at a given point of a screen surface as compared to that of a diffuse standard when observed from the same angle.

Washout:
The reflection of stray, or ambient, light from one side of the screen directly onto the other, thus interfering with the intended image.

NOTE: For other important and interesting related terms, see "The Legendary Lexicon of Projection," (H-50-12), now available in *REEL PEOPLE Collection*. Back issues of *Film Notes for the REEL PEOPLE*, with a couple of exceptions, are no longer available individually. However, we have assembled the first 14 issues into a softcover book called *REEL PEOPLE Collection*, KODAK Publication No. H-50. And, in addition to the 14 back issues, we've squeezed in some fun-to-read tidbits and trivia about the "movies" we're sure you'll enjoy.



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