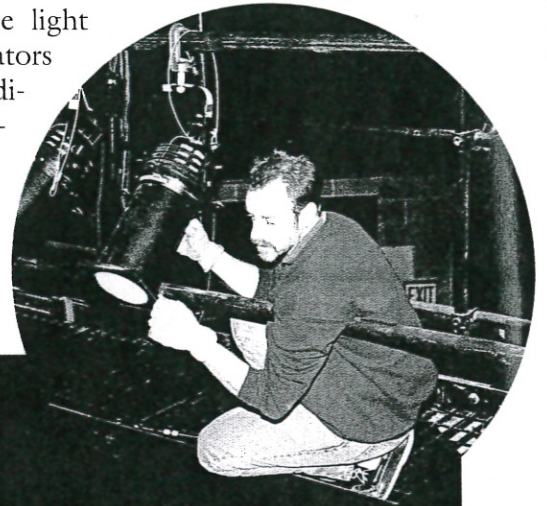


## Lighting and Sound Crews

The lighting and sound crews stay busy in a variety of workspaces: they can be found in the scene shop, where lighting instruments, electrical cable, and other equipment are often stored and maintained; on the stage, where lights and microphones are hung and positioned; backstage, where speakers, projectors, and other equipment may be placed; and in the light and sound booths, usually located in the house. From their booths in the house during a show, the light board and sound board operators can see and hear what the audience hears and make any necessary adjustments.



# Lighting: Equipment and Supplies

## Lighting Equipment

### LIGHTING CONTROL EQUIPMENT

**lighting control board and system** for controlling the operation and intensity of lighting instruments; computerized lighting systems operate lights based on information input and stored electronically on disk or CD

**headset** for communicating between the light board operator and the stage crew; may be a complex system or radio- or battery-operated

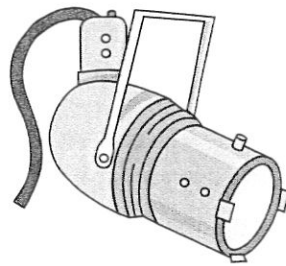
### LIGHTING INSTRUMENTS

**ellipsoidal reflector spotlight (ERS)** for throwing a strong, focused beam from a distance; sometimes called a **Leko**

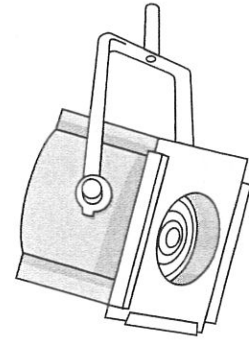
**Fresnel spotlight** for shorter throws covering a large area with soft, diffuse light

**followspot** for throwing bright, focused light on a moving performer  
**ellipsoidal reflector floodlight**, or **scoop** for illuminating large areas of the stage

**strip lights**, or **border lights** for washing light over a large area of the stage or onto scenery



Ellipsoidal reflector spotlight



Fresnel spotlight

## Lighting Supplies

### LAMPS

**incandescent** (standard lamps with medium, mogul/bipost, or candelabra/prefocus screw bases) for use in strip lights, floodlights, and wall sources; wattage varies according to use

**halogen lamps** (energy-efficient, high-intensity lamps with medium and candelabra/prefocus bases) for use in spotlights; wattage varies according to type and use

### LIGHTING INSTRUMENT ACCESSORIES

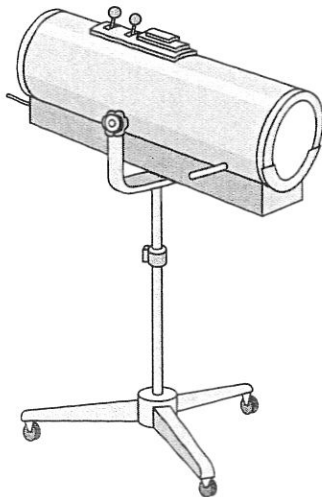
**gelatins**, or **gels** (color filters) for casting colored light from a spotlight  
**gel frames** for holding gels  
**gobos**, or **cookies** (metallic disks with cut patterns) for casting light patterns from a spotlight

**top hats** for narrowing the beam of a spotlight

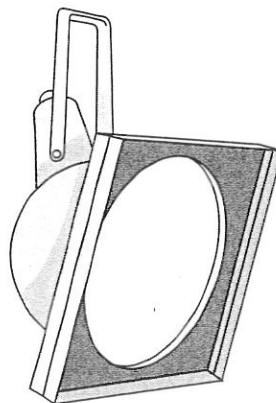
**barn doors** (folding flaps on a metal frame) for shaping the beam of a light  
**plano-convex**, **step**, and **Fresnel lenses** for spotlights

### ELECTRICAL AND RIGGING SUPPLIES

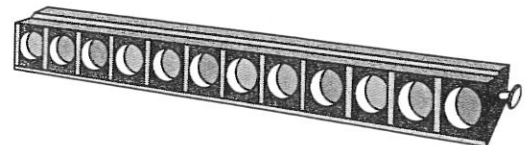
**male/female connectors** (twist-lock, locking grounded-pin, Edison), **twofers**, **triples**, **electrical cable**, **wire strippers**, **wire crimpers**, **9-volt batteries** (for headsets), **electrical tape**, **duct tape**, **safety chains**



Followspot



Floodlight



Strip lights



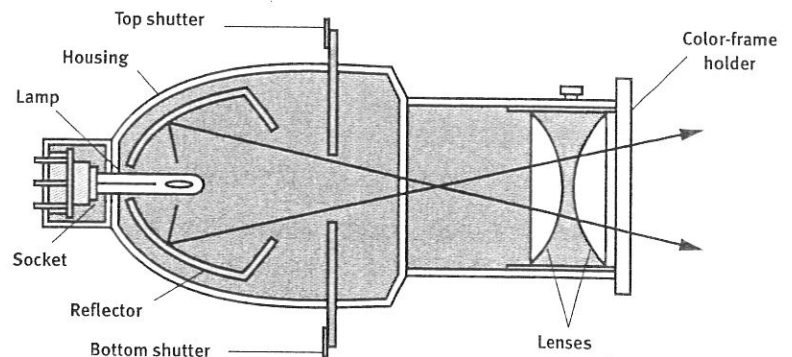
## Lighting Basics

Four basic types of lighting instruments are used for stage lighting: spotlights, floodlights (scoops), followspots, and strip lights. Their uses reflect differences in the **throw**, or distance, the light can be cast and the nature of the circular beam cast—a hard- or soft-edged light.

A lighting instrument is composed of four basic parts: the **lamp**, which is the source of light; the **reflector**, which reflects the light; the **lens**, which shapes the light; and the metal **housing**, which encloses the system. The housing includes features that allow color filters, or **gels**, and other devices to be attached to the instrument for enhancement and control of the light beam. The housing also has a handle from which to **hang**, or attach and position, the light. Most lights are hung above the stage on a wood or metal pipe called a **batten**. Followspots are usually mounted on a wheeled light stand and positioned in a balcony or the light booth.

The lights are controlled from the lighting control board, which houses or is connected to a dimmer. A **dimmer** is an electrical device that controls the brightness of the lighting instruments. One dimmer switch may control more than one instrument.

Each stage light is connected to the system by an electrical cable running from the instrument to a stage outlet. A standard electrical cable on a lighting instrument is two feet long. When the light is more than two feet from an outlet, or when several instruments need to be plugged into the same outlet, you need to make an extension cable.



Cutaway of an ellipsoidal reflector spotlight

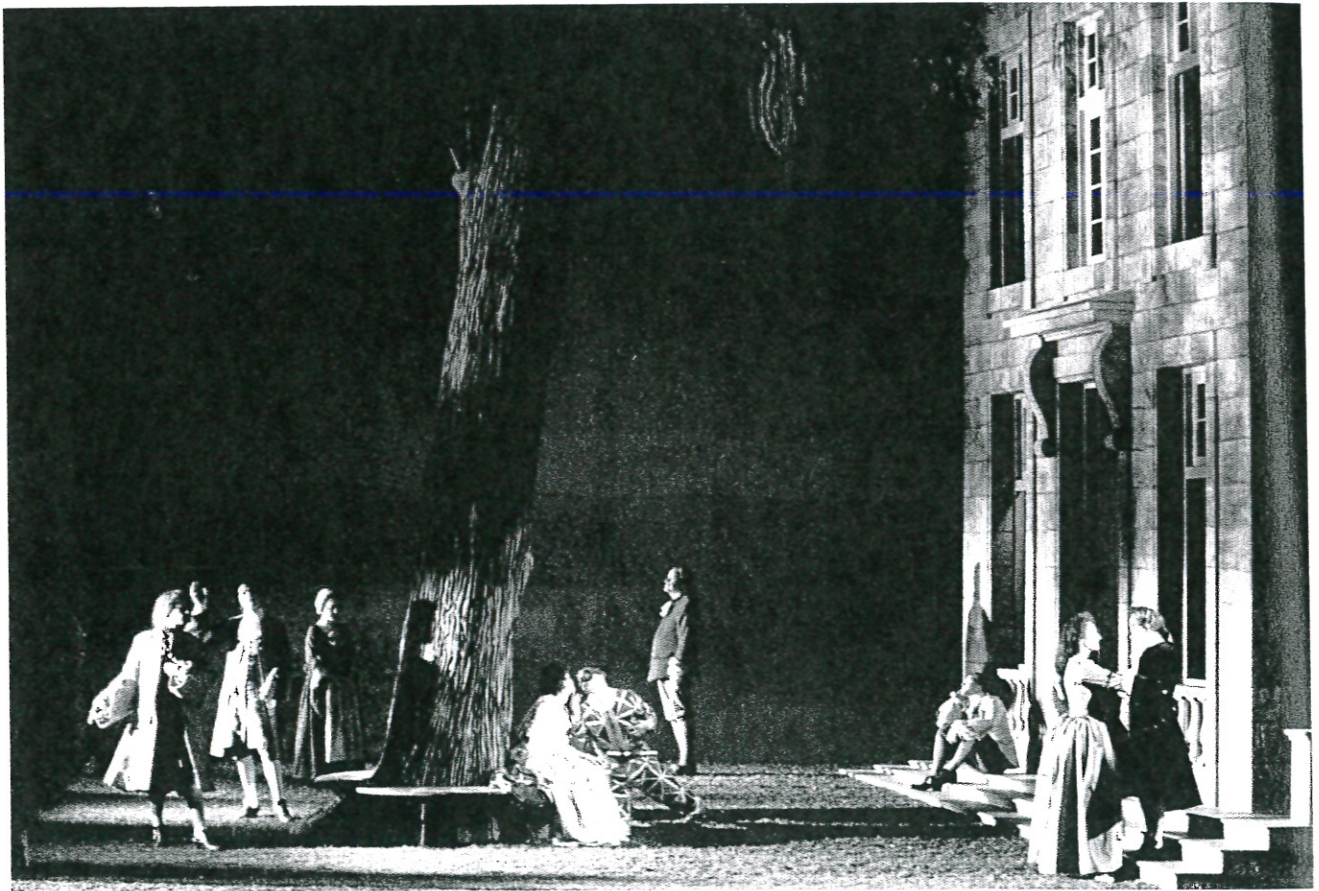
## Lighting Design

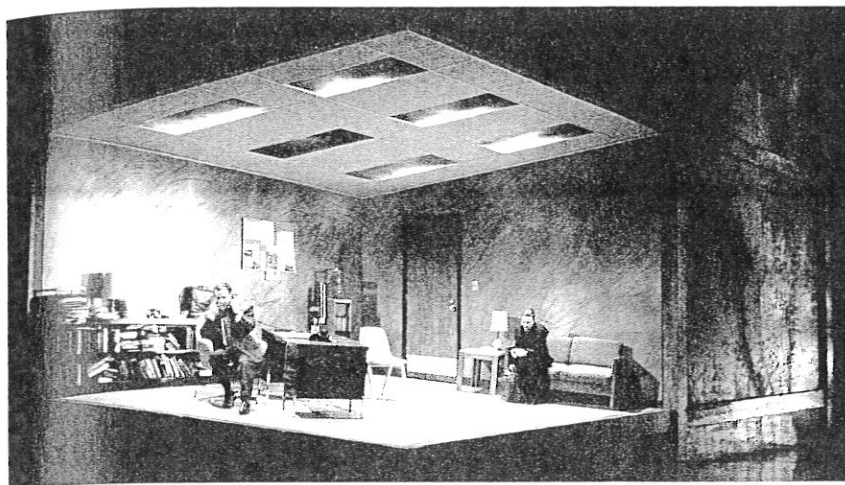
Set designers may envision lighting effects they hope to see and may even sketch in ideas on a ground plan, but they don't usually determine the location of lights or the way in which the lights are hung. Decisions about the way to hang the lights are left to the lighting designer and crew.

### Script Analysis for the Lighting Designer

As a lighting designer, your decisions about lighting can dramatically affect the production. To make informed decisions about lighting design, read the script with the ground plan in hand and make notes in your Theatre Notebook about changes in location, mood, and time of day. Discuss the style and mood of the play with the director and set designer. As you develop a design that fits the production concept, make sketches or collect pictures showing the moods and effects you would like to achieve.

Side lighting is used to create the effect of a painting in this production of *A Game of Love and Chance* by Pierre Carlet de Chamblain de Marivaux. What mood is suggested by the lighting? What time of day is suggested?





The fluorescent lighting effect for this production of David Mamet's *Oleana* helps to create the harsh, uncomfortable atmosphere of a threatening office environment.

## Acting and Lighting Areas

To achieve the lighting effects you have decided upon, you will need to manipulate the distribution of light over the stage area; the intensity, or brightness, of light that strikes the stage; the movement of light in followspots; and the color of individual lamps.

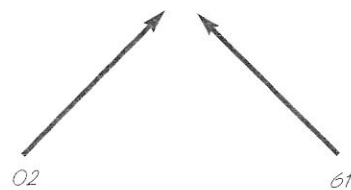
The stage is usually broken up into **acting areas**, spaces onstage defined by the blocking patterns of actors in a scene. Each acting area must be lit at some point in the performance. Often, more than one acting area is lit at once; therefore, to create a smooth wash of light, you will need to overlap the light beams shining on each acting area by about one-third. These light beams, which are approximately 8 to 12 feet in diameter where they strike the stage floor, can be referred to as **lighting areas**.

Generally, each lighting area should be lit by at least two lighting instruments at 90° angles toward each other. One is the **key light**, which is the brightest of the two. The other is the **fill light**, which fills in shadows created by the key light. Often one of these two instruments will have a warmer-colored gel and one will have a cooler-colored gel.

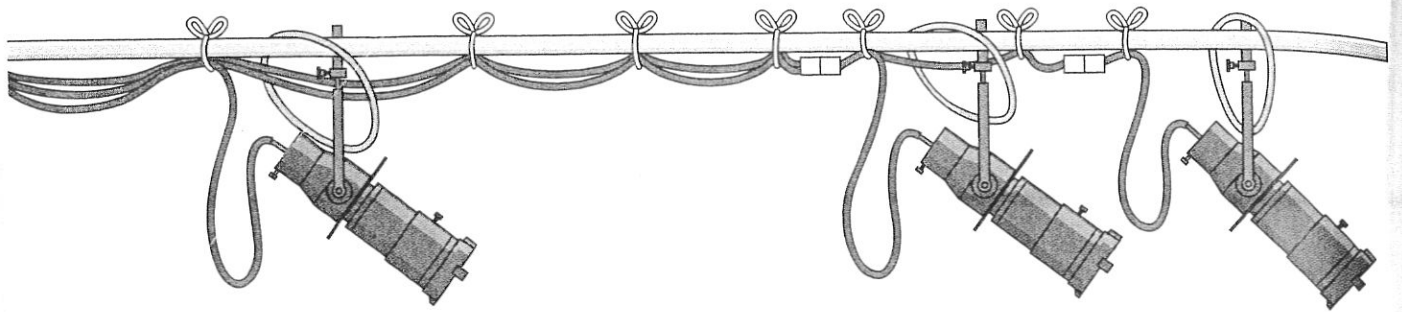
## The Lighting Key

The angle and color for each lighting area can be shown in a simple diagram called a **lighting key**. Keeping the principle light source in mind (sunlight, lamplight, firelight) will help you decide which colors to use with which instruments. The colors of the set and costumes will be affected by the colors of your lights, so you can't really test the effectiveness of your lighting key until the set is mostly dressed and costumes are designed.

To help you keep track of the lighting configuration you have designed, draw a **lighting plot**, which shows where you intend to place various lights and prepare an **instrument schedule**, which puts this information into a chart format for reference.



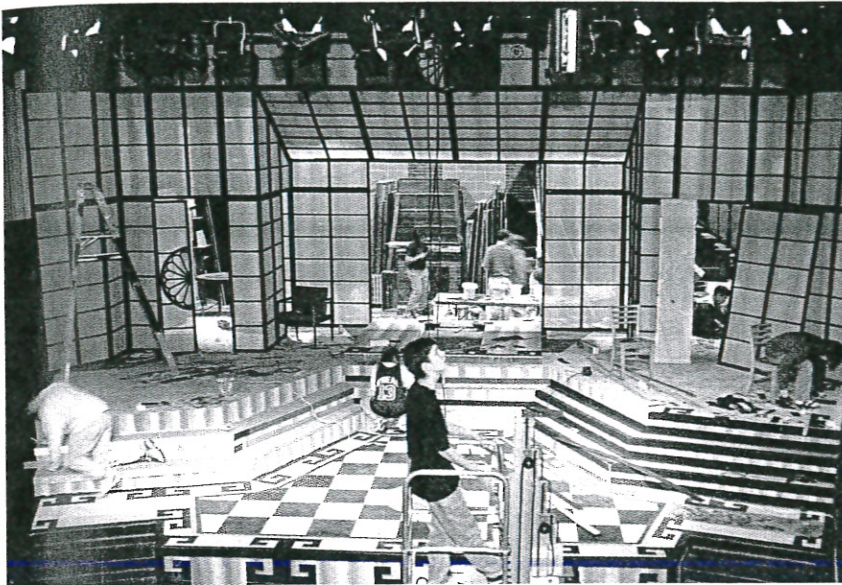
Two-source lighting key for John Osborne's *Look Back in Anger*



### RIGGING A LIGHTING BATTEN

1. Assemble your equipment: electrical cable (including extension cables, p. 85); Crescent wrenches; safety chains or cords; and cotton cord, duct tape, or gaffer's tape.
2. Lower the batten to a comfortable working height. (Call "Heads!" to warn everyone that a batten is coming down.) If you are using a ladder or lift, make sure it's the appropriate height. Check the lighting plot to find out the type of lighting instrument required and the rough position of the instrument.
3. Begin with lights farthest from the **drop end**, the end where the cables will drop to the floor and run to the circuits.
4. Position each light on the batten and tighten the clamp by hand.
5. Check the position again against the lighting plot; if it's accurate, tighten the clamp securely with your wrench.
6. Add a safety chain or cord to prevent the instrument from falling if the clamp should come undone. A **safety cord** is a two-foot length of wire rope with a loop at one end and a snap clip at the other.
7. Secure the cable to the batten at two- or three-foot intervals using cotton cord, duct tape, or gaffer's tape. Leave enough slack between the batten and the instrument so that it can be moved easily during angling and focusing. Make sure that the cable doesn't touch any part of the instrument that will get hot and that it doesn't hang below the bottom of the instrument where it can get caught or get in the path of the light beam.
8. If any of the instruments operate together and need to be plugged into the same dimmer circuit, connect the two instruments with a short cable and a twofer (p. 85).
9. Pull out the shutters on the ellipsoidal reflector spotlights so you can see when the instruments are on.

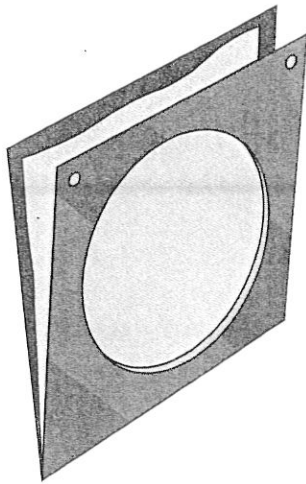
10. Secure cables together at the drop end and let them drop loosely.
11. Adjust the counterweights to make sure the batten is balanced.
12. Run the cables to the dimmer circuits.
13. Test each instrument. If one doesn't operate, adjust the connections or check the lamp.
14. Raise the batten to operating height.
15. Tape loose cables to the floor with duct tape or gaffer's tape.



#### TECH TIPS: HANGING LIGHTS

- Mark on the **yoke**, or handle, of each the instrument type and the wattage before you begin hanging the lights to ensure that you have the right instruments and lamps.
- Wear cotton garden gloves to protect your hands from hot instruments.
- On a piece of tape, mark the ends of each instrument cable with the number of the instrument and its circuit. When all the cables are grouped together at the drop end, you will know where each is to go.
- Attach your Crescent wrench to a phone cord on a dog clip attached to your belt loop to prevent it from falling while you are working.
- Coil five or six feet of extra cable around the far end of the batten in case you need to make changes to the rigging.
- To prevent a faulty instrument from short-circuiting a dimmer, first test your instruments using nondimmer circuits.





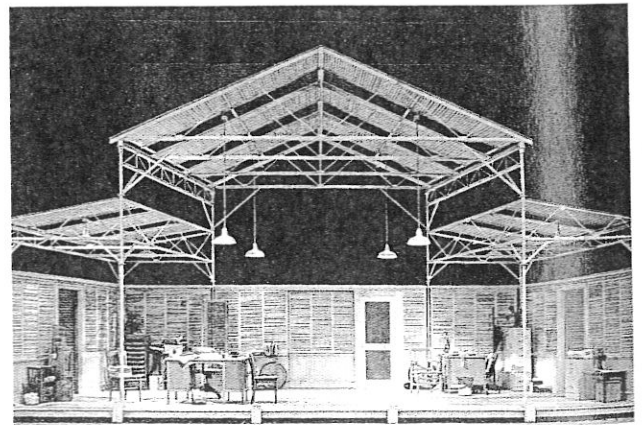
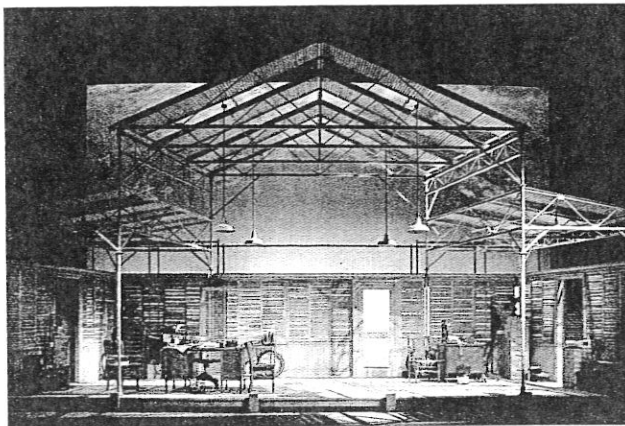
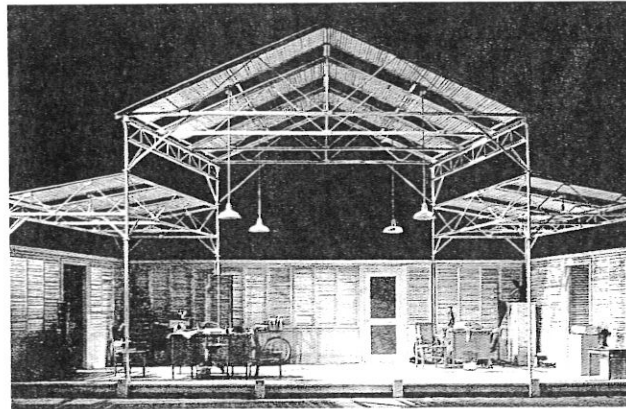
Gel and gel frame

## Installing Gels

Gels are thin pieces of colored plastic that fit into a frame on the end of a spotlight. Gels change the color of light that falls onstage. They can be used singly to create a colored spot, or combined with other gels to create special lighting effects. To prepare a gel, use scissors or a matte knife and straight edge to cut the gel to size. If you are using a matte knife, be sure to cut on a cutting board to protect the surface under the gel. Use a white grease pencil to write the manufacturer name and number on the gel (or whatever name your school uses for the color). Then insert the gel into a gel frame. You can attach gel frames to the lights as you angle and focus them.

At this point, you can also insert any gobos you may be using. A **gobo** is a thin metal template with a pattern punched out. It can be attached to ellipsoidal reflector spotlights in a frame to project a patterned or textured light.

Lighting on this set for *Shimada* by Jill Shearer dramatically conveys different times of day and moods, primarily through the use of color.





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This actor, portraying Peter Pan in Elizabeth Egloff's *Peter and Wendy*, an adaptation of J. M. Barrie's *Peter Pan*, is strikingly illuminated by a combination of side and front lighting.

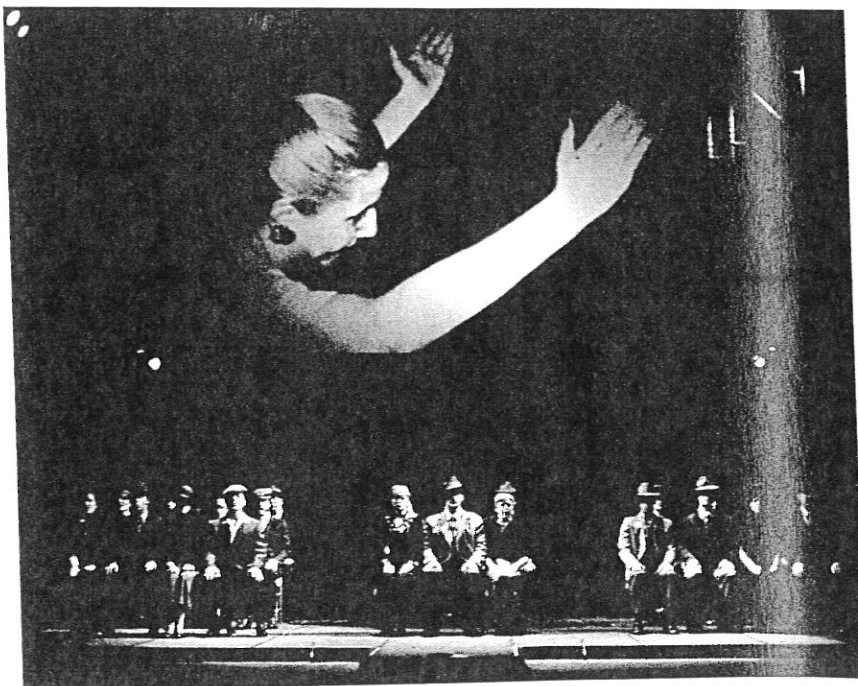
## Angling and Focusing Lights

You need at least three people to angle and focus lights. One person must occupy the control board to view lighting effects and turn lights on and off. Another crew member or two must remain onstage to help pinpoint the places where light and shadows fall. The other crew members take positions at the lights that require angling and focusing.

To ensure lighting for each acting area, the crew members onstage should walk through parts of important scenes. Any time that they can see only one bright light, they should report that they are in a **dead zone**. Additional lights should be focused on that spot. Any time they find three or more bright lights in view, they should report a potential **hot spot**, so the crew can angle some light away. The goal is to avoid having dead zones and hot spots. Remember, you will be focusing lights to illuminate actors, especially at the level of their heads. Avoid angling and focusing lights to illuminate the stage floor.



Using a front-screen projection for this image from *Evita* isn't problematic because the actors are not in front of the screen.



You can project images onto a projection screen from a projector sitting somewhere in front of the screen—**front-screen projection**, or from a projector positioned behind the screen—**rear-screen projection**. Your choice of front-screen or rear-screen projection will determine the appropriate projection screen.

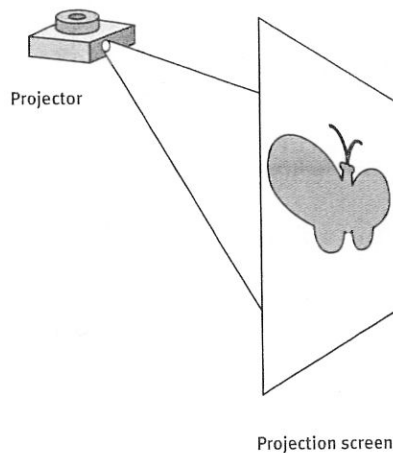
White, highly reflective commercial screens are designed to reflect light. An inexpensive alternative to a commercial screen is to cover a smooth surface, such as muslin or Masonite, with white paint. You can project images onto a white cyclorama (p. 335) as well.

Unless you are continuously projecting an image or a color wash during a production, you won't want to distract the audience with a large white screen in the middle of a stage. One alternative is to use parts of the set itself as screens. Obviously this will have some impact on the paint used on the set, or at least those parts that will be used for projections, and the set designer will have to take that into account in the set design.

One of the drawbacks of front-screen projection is that the onstage actors may cast shadows on the screen. You can eliminate this problem by using rear-screen projection.

The challenge of a rear-screen projection approach is the **hot spot**, an intense circle of light created when a projector lens is seen through the screen. To avoid hot spots, either position the projector at an angle to the screen, outside the audience's sight lines or use a screen material that eliminates it.

If you position the projector outside the audience's sight lines, you can use translucent materials such as scenic muslin and other fabrics of similar weight and weave that transmit light. For a crisper image, prime the muslin with a solution of starch and water—one cup of starch per gallon of hot water. If the muslin is to blend in with the scenery you can paint it with dye. Do not use paint on the muslin since paint is not transparent. A couple of options to muslin screens include white plastic shower curtains and white plastic drop cloths sold in paint stores.



### Image Interference

In both front- or rear-screen projection, eliminate **ambient light**, or existing surrounding light, as much as possible and position the screen so that actors don't block the screen from the audience's view. Hanging the screen so that its bottom edge is five to seven feet above the stage floor will help with these types of image interference. Rear-screen projection is less affected by ambient light than front-screen projection so try to use that technique whenever possible.

### Keystoning

When designing projections and projection systems, be conscious of the distortion that occurs when an image is projected at an angle onto a screen or other projection surface. This commonly happens when you angle a projector for rear-screen projections to avoid hot spots and when you project an image from a spotlight on an overhead batten. The distortion is called **keystoning** because it resembles the shape of a traditional triangular keystone (p. 210). To compensate for keystoning, you can either angle the screen so the projection axis is perpendicular to the screen surface or design the image so that it's distorted at an angle equal and opposite to the angle at which the projection strikes the screen.

### Slide Preparation

Scenic projectors use both painted slides and photographic transparencies. Remember to sandwich both kinds of slides between sheets of projection-grade glass available at photography stores. The glass prevents the slides from crinkling or melting and it also keeps the slide vertical. Use transparent inks on glass slides; opaque ink absorbs heat and it may cause the glass to crack.

