Chapter 5

LIGHTING EQUIPMENT AND DESIGN

In recent years, advances in video technology have made it possible to produce cameras with greater sensitivity to light than were available in the past. As a result, the basic light levels cameras need for seeing have decreased. But this change does not mean that we can be less careful in planning lighting designs. What principles can guide us in designing a sensible **light plot**—that is, a precise plan showing the types, sizes, positions, and directions of all the lights that will be used? How can lighting enhance the purpose and meaning of a television program?

In addition to providing visibility, lighting enhances the illusion of depth of objects and performers. Lighting can also add meaning, visual beauty, mood, and dramatic dimension to a scene. Lighting provides composition by incorporating shadows and highlights as well as brightness and darkness, thus avoiding giving every object seen by the camera equal status. A picture composed with light and shadow can direct the attention of the viewer to important parts of the image, selectively adding or reducing emphasis.

In creating a lighting design, the process begins by reading through the script. The script should, whenever possible, indicate set elements, talent requirements, subject matter, content, sequence of events, tone, and purpose of the program, all of which help determine lighting needs. The script might also indicate time of day, locale, and the presence of specific light sources such as sunlight or lamplight. Important information about talent movement may also be given, and this too can influence lighting decisions. The light plot is further conditioned by the physical limitations of cameras and the physical constraints of the set or the field space (for instance, ceiling height, size of studio, location and direction of the sun, etc.).

It is essential to develop light plots holistically, that is, to recognize that light-ing decisions affect, and are affected by, all the physical and symbolic elements of every production. Therefore, lighting design should be viewed as an integral part

of the overall production process. After surveying the common types of lighting equipment used in video production, this chapter presents a rationale and techniques for creating lighting designs that are pleasing, efficient, and consistent with program content and objectives. The topics include the following:

Lighting equipment

- Lighting grid
- Dimmer board
- Lighting instruments
- Additional lighting equipment

Fundamentals of lighting design

- Naturalistic lighting
- A sample naturalistic light plot

Departures from naturalism

- Flat lighting

Motivating light sources

Lighting in more complicated cases

Field lighting

- Procedures
- Equipment

LIGHTING EQUIPMENT

This section describes lighting equipment used in studio production. Field lighting is discussed later in the chapter. Among the items to be discussed are the lighting grid, the dimmer board, common types of lighting instruments and their components, and peripheral equipment and hardware.

Lighting Grid

The studio environment contains a **lighting grid** (see Photo 5.1) that consists of a series of parallel or cross-hatched sturdy metal bars hanging near the ceiling or affixed to the studio walls close to the ceiling. The grid provides numerous locations for hanging lighting instruments above sets and talent on the studio floor. In addition to the grid itself, electrical outlets are spaced near each bar at regular intervals to provide electrical power. Lighting grids make it easy to light sets and
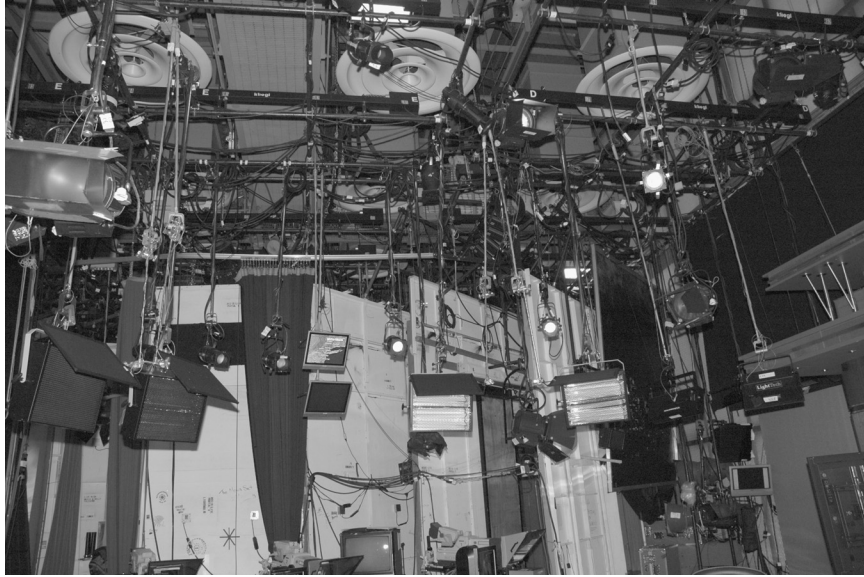
Photo 5.1   Lighting grids provide locations for hanging lighting instruments above sets and talent on the studio floor. In addition to the grid itself, electrical outlets are spaced at regular intervals to provide electrical power.

talent from above. Lighting grids also get lights and cables off the floor so that cameras can move more freely around the studio floor.

Dimmer Board

Electrical outlets are wired to a **dimmer board** (see Photo 5.2) equipped with switches and faders that permit single instruments or groups of instruments to be turned on and off instantly or faded up and down gradually. The dimmer board may be located in the studio, in the control room, or at some other remote location. Many dimmer boards permit the grouping or *ganging* together of selected instruments, which can then be manipulated with a single fader or controller. Some dimmer boards use rheostats as dimmers. Others use computer software, making them capable of executing complex instructions. Many boards provide a master switch for controlling electrical power to all instruments connected to the system.

Lighting Instruments

Among the most commonly used lighting instruments are those that provide directional sources of light, called spotlights, and those that provide more diffuse sources of light, called floodlights. The most common spotlight used in television
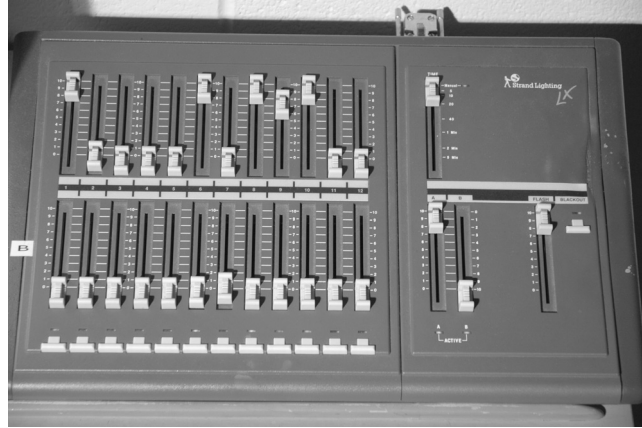
Photo 5.2   Dimmer boards enable you to control lighting instruments used in a production with both faders (for varying intensities) and switches (for turning lights on and off).

Photo 5.3   The Fresnel spotlight has a lamp, reflector, lens, and a focusing knob for controlling the spread of the light beam it produces. It comes in a variety of wattages, depending on production needs. Notice the set of *barn doors,* or black metal flaps, used to block light from parts of the studio where it is not wanted.

production is the **Fresnel spotlight** (pronounced "fra-nell"), named after the French physicist, Augustin Fresnel, who invented its special lens (see Photo 5.3). The major components of the Fresnel spotlight that enable it to serve as a directional light are its lamp, reflector, lens, and focusing apparatus.

The Fresnel lens has a plano-convex shape with stepped concentric rings enabling it to throw a beam of directional light onto the subject. A reflector located

behind the lamp directs light out through the lens. Turning a focusing knob changes the spread of the beam by moving the lamp and reflector either toward or away from the lens. Focusing is made possible by mounting the lamp socket on an adjustable worm gear connected to the focusing knob at the back of the instrument housing; some instruments use a sliding mechanism to move the lamp. Either way, as the lamp is moved closer to the lens, the beam spreads out and becomes less intense as it covers more area. As the lamp is moved away from the lens, the beam narrows and becomes more intense as it *spots down* to cover less area. Hence, intensity and coverage area can be controlled.

In addition to the components mentioned above, the Fresnel spotlight is often fitted with external, adjustable, black metal flaps, called *barn doors* (shown on the left in Photo 5.3), which provide a means of controlling the spill of light from the instrument. It is also fitted with a *gel frame holder,* which permits the attachment of color filters, as well as *diffusers* or *scrims,* which are neutral-color filters for softening or reducing light intensity. Fresnel lights commonly come in 500-watt, 750-watt, 1,000-watt, and 2,000-watt power ratings, with 6-inch, 8-inch, and 10-inch lens diameters. Other ratings and sizes are also available. Selecting the appropriate instrument depends on studio size, limitations of the lighting board and power source being used, and the nature of the production.

Compared to spotlights, *floodlights* provide a more diffuse, nondirectional base light to large areas. They are often used to light large areas of scenery and backdrops (see Figure 5.1). Floodlights are often used as *fill* lights since they are used in front of talent and opposite spotlights to fill in and reduce harsh shadows that may be caused by spotlights.

(a)   **(b)**
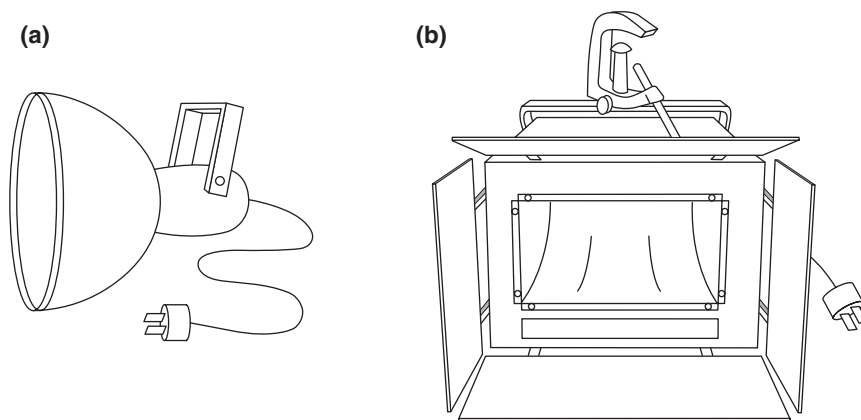
Figure 5.1   Floodlights are a broad category of lighting instruments and include (a) *scoops* and (b) *broads.* Floodlights are designed to fill in and reduce shadowy and dark areas. Some lighting manufacturers call their fill lights *soft* lights.

Floodlights are comparatively simple devices, consisting of a lamp (available in wattages comparable to those for spotlights) and a reflective surface inside the instrument housing. Because of the shape of the housing, some fill lights are called *scoops* (see Figure 5.1a). Others with a more box-like shape are called *broads* (see Figure 5.1b). Fill lights offer few options for controlling spill and intensity. Of course, if the light is attached to a dimmer, light intensity can be controlled to some extent by dimming, but the more you dim a light, the more you change its color temperature, and this can create unwanted effects in the way colors are reproduced by the camera. A better way is either to change the distance from the light to the subject or to use *scrims* or *diffusers,* which are spun-glass materials placed in front of lighting instruments to soften their intensity.

Another, more specialized type of lighting instrument, with a sharp-edged and highly controllable beam of light, is the *ellipsoidal* spotlight (see Photo 5.4), so named for the elliptical shape of the reflective surface inside the instrument housing. The ellipsoidal spotlight sends an intense beam of light through an adjustable iris that controls the diameter of the light beam. After passing through the iris gate, the light beam may be further shaped by a customized pattern insert, a metal disk with shapes cut out of it; this insert is called a *pattern* or *template.* The light is then focused by a large, compound lens. This arrangement makes the ellipsoidal spotlight useful for pattern projections onto backdrops and other surfaces.

Several other lighting instruments deserve mention. These include *strip lights, follow spots,* and *camera lights* (also called *eye lights*) (see Figure 5.2). A strip

Photo 5.4   The ellipsoidal spotlight produces a well-defined beam that can be further shaped with metal pattern inserts. In this photo, the *C-clamp* used to affix the instrument to the lighting grid is clearly in view, as is the lamp's *safety chain,* used to further ensure that the lamp stays where it belongs.

(a)

(b)   (c)
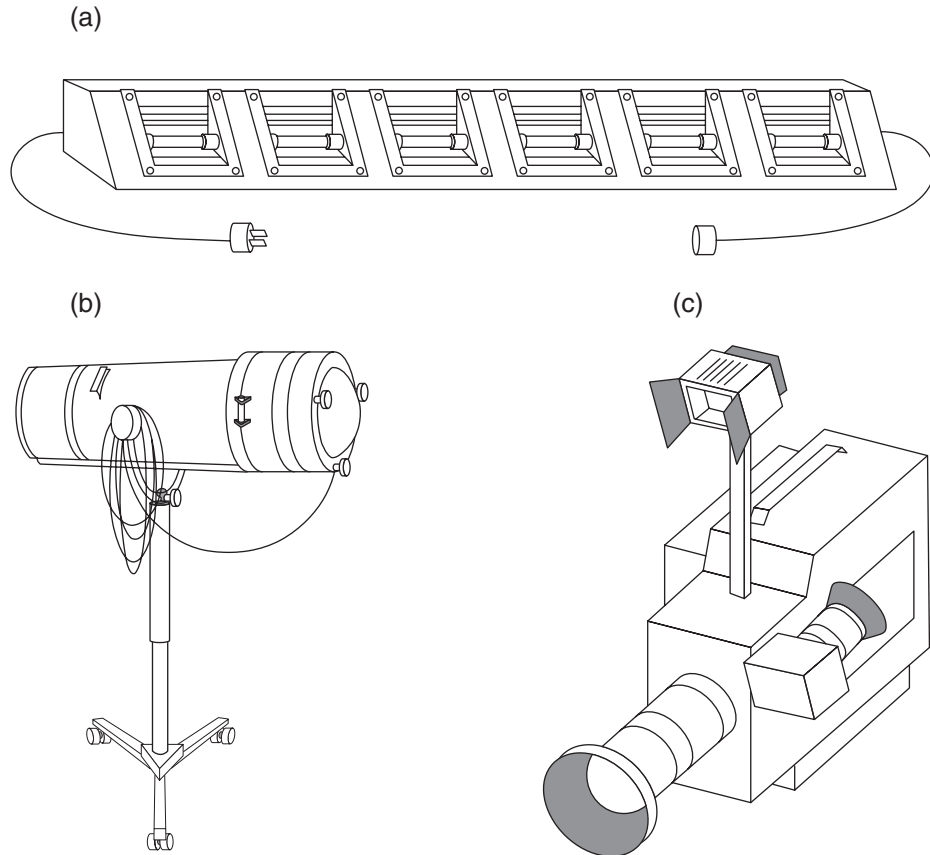
Figure 5.2   Other common types of lights include (a) strip lights, (b) follow-spot projectors, and (c) camera lights.

light is an oblong box containing a series of small lights that can be fitted with colored gels and used to light sets and backdrops. These small lights may be either hung from the lighting grid or set up on floor stands or on the ground close to the surface they are lighting, hidden by scenery and out of camera view. Strip lights are also useful for lighting sets in highly stylized productions where they can add a festive and decorative accent; for instance, they can be used on runways for fashion shows or to create traditional footlight effects for performers.

Follow spots are powerful, stand-mounted spotlights that require an operator. They are useful for following action on the set, especially in musicals and variety shows. Follow spots throw a powerful beam of light with an adjustable sharp or soft edge.

Finally, *camera lights* (or *eye lights*) are small, low-power lights mounted on top of cameras commonly used for filling in dark areas, eliminating shadows, and providing additional sparkle to talent faces and eyes.

Working With Lighting Equipment

➤ To avoid burns, wear protective gloves when working with hot lights.

➤ Unplug instruments before changing bulbs (even ones that are not hot).

➤ Even with cold bulbs, don't touch them with your bare hands. When installing them, hold them with a soft cloth, paper towel, or even the box they came in. This will keep oil from your hands from getting on the glass, which may cause the bulbs to shatter when they heat up.

➤ To avoid shocks, turn off the power at the dimmer board before connecting or disconnecting lights.

➤ If you climb a ladder to move a light, have a helper standing by who can "foot" the ladder (stabilize it with his or her foot) and take instruments out of your hands before you climb down.

➤ Make sure the ladder you use is in good condition and is approved for electrical work.

➤ When reconnecting lights to the grid, always reattach the safety chain to keep the lights from falling on people below.

➤ Before turning on lights, be sure you have not exceeded the safe power limits of the system.

➤ Periodically check the dimmer board and circuit breakers for proper functioning to avoid risk of fire if you accidentally overload the system.

➤ If you use light stands, secure them with sand bags or tie-downs, especially in high traffic areas, and put up proper warnings so that stands do not get knocked down.

➤ Electrical cables running across the floor can trip people. Secure your lighting wires, cables, and extension cords with gaffer's tape or tunnel tape to minimize hazards.

➤ Cables can be protected with cable troughs to keep them from being damaged, and they can be hidden from view with rubber mats.

➤ To keep cables from getting warm, don't bunch them together.

Additional Lighting Equipment

In addition to the lights themselves, other types of equipment are critical for rendering high-quality lighting designs. Among the more important is the **light meter** (see Photo 5.5), which measures light in terms of *lux* or *foot candles,* standard measures of light intensity falling on a given area. A foot candle refers to the light intensity produced by a standard candle (specified precisely in terms of size and material) at a distance of one foot. One lux equals about one tenth of a foot candle.

Light meters are of two types: *incident* and *reflected.* An incident light meter measures the amount of light falling on a subject. To use one correctly, aim the meter's sensor at the principal camera from the place the talent will be. A reflected light meter measures the amount of light reflecting from a subject. To use one correctly, aim the meter's sensor at the subject to get a proper reading. Light meters are useful for locating and adjusting hot spots and dark spots in a production area.

Photo 5.5 A light meter.

Remember, however, that surrounding light conditions can change from moment to moment, from camera shot to camera shot, and that extremely dark or bright backgrounds can affect the accuracy of meter readings. Remember also that different cameras may have different performance characteristics, such as different operating light levels and different contrast ranges, and may therefore perform more or less adequately in the same light. For these reasons, light meter readings alone cannot guarantee desired results.

Therefore, it is essential to check the final court of appeals, the **waveform monitor** (see Photo 5.6a), in the control room. The waveform monitor graphically displays the white and black levels in the video signal, making it possible to control brightness, which must be kept within proper limits to maintain video quality. Two controls enable you to maintain brightness levels: the *pedestal* control and the *iris* control, both of which should be adjusted while referring to the waveform display. Adjusting the pedestal and iris controls is called *shading* the camera. Aside from providing optimal contrast range, proper shading reduces or eliminates jarring brightness differences when cutting between different cameras during a show.

To set brightness levels most efficiently, it is best to use a *chip chart* (see Photo 5.7), which displays shades of gray from black to white. The darkest area on the chart is called *TV black,* and the lightest is called *TV white.* To use the chart, place it where talent will appear with the lights turned on as they would be for the actual program. Then focus the camera on a full shot of just the chart, and adjust the pedestal and iris levels so that the brightest portion of the picture registers 100 on the waveform monitor and the darkest portion of the picture registers 7.5. This procedure ensures that you are getting the proper contrast range for most situations.

(a)

(b)
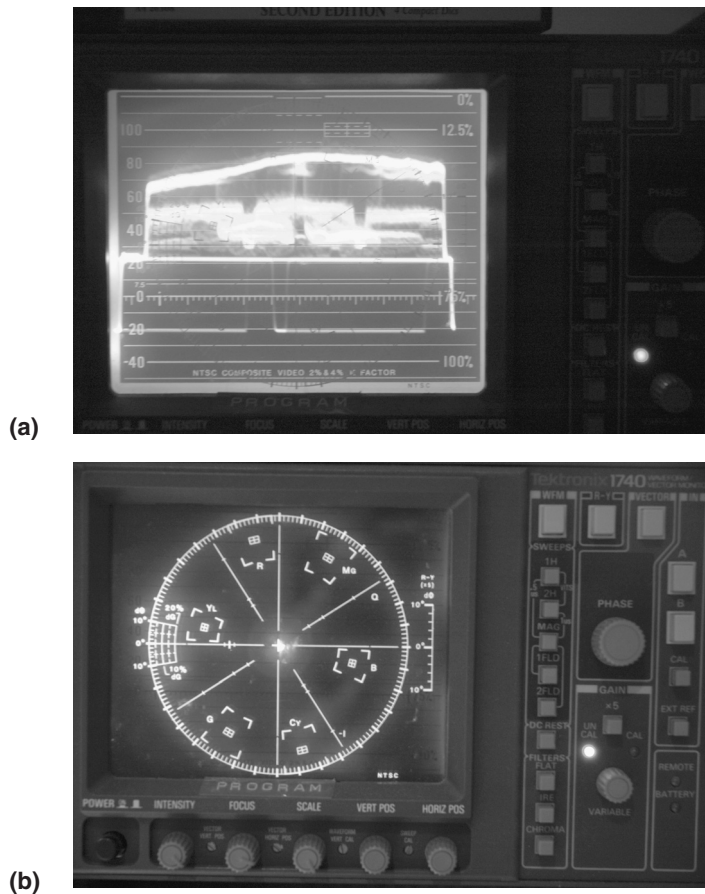
Photo 5.6   The waveform monitor is used to adjust brightness levels for cameras to reduce jarring differences across cameras and to render images with optimal contrast range and image quality. A vectorscope is used to adjust color.

Just as a waveform monitor is used to set brightness levels to ensure the best possible contrast range, a **vectorscope** is used to adjust color (see Photo 5.6b). To balance color reproduction with the vectorscope, a standard *color bar chart* may be used in the same way you would use a chip chart for adjusting contrast range. The vectorscope displays six small squares inside a circle, marking the areas where the three primary and three secondary colors should appear when colors are rendered accurately. Adjustments are made to align the colors the camera is see-ing with their designated locations. When all six colors appear in their proper loca-tions, colors seen by the camera should be accurately reproduced.

GRAY SCALE REFLECTANCE CHART
HALE COLOR CHARTS, INC.
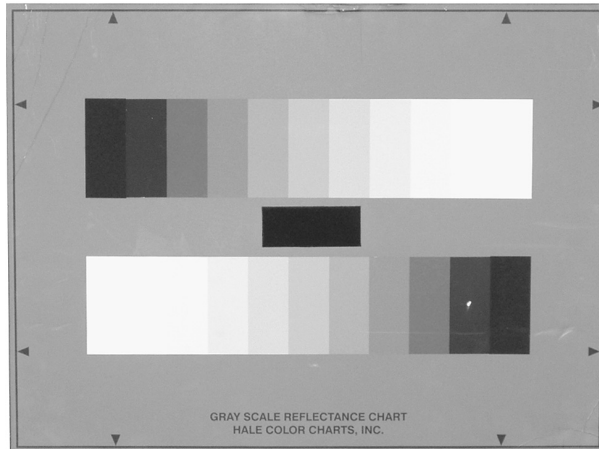
Photo 5.7   A chip chart, such as the 11-step version pictured here, is used with the waveform monitor for setting white and black levels.

Several other types of peripheral equipment are also important:

Reflector boards (see Figure 5.3)—boards or sturdy cards with bright white, silver, or even mirrored surfaces—are used to bounce light onto a subject. They find frequent application in field settings to alter the effects of sunlight.
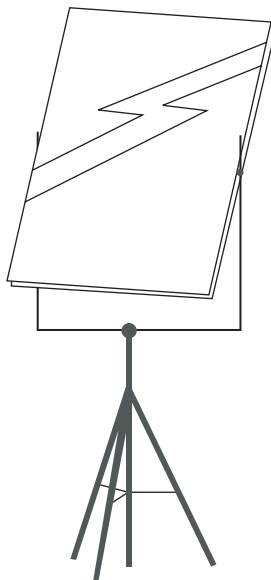
Figure 5.3   Reflector board.

Rods and pantographs (see Figure 5.4) are expandable devices used to lower lighting instruments from the lighting grid to a desired height closer to the studio floor. Pantographs may also be used to adjust the position of mounted television monitors.
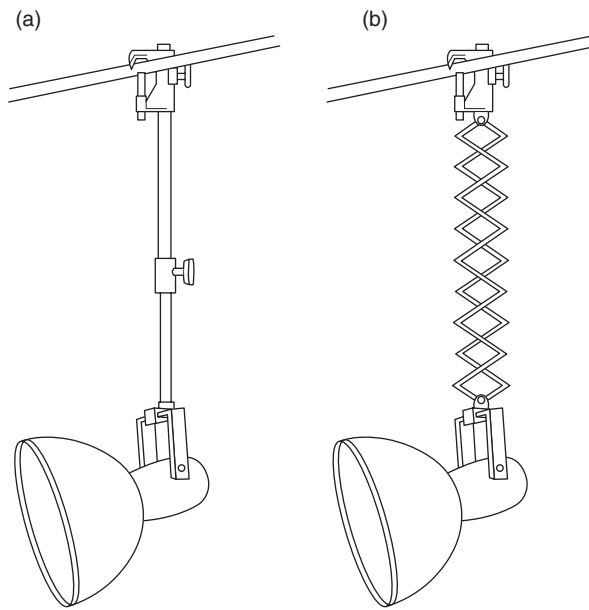
Figure 5.4   Rods (a) and pantographs (b) are used to raise and lower the heights of lighting instruments.

C-clamps (visible in Photo 5.4) are screw-down devices used to affix lighting instruments to lighting grids and stands.

Safety chains (also visible in Photo 5.4) keep instruments from falling if their C-clamps come loose.

FUNDAMENTALS OF LIGHTING DESIGN

At the simplest level, lighting design principles are usually grounded in **naturalism.** The naturalistic approach recognizes that over millions of years, we have been conditioned to see objects illuminated from above by a single main source of light. This is because we inhabit a solar system featuring only one sun, which provides our main source of light. Normal lighting, to us human beings, must be consistent with this arrangement.

(a)   **(b)**
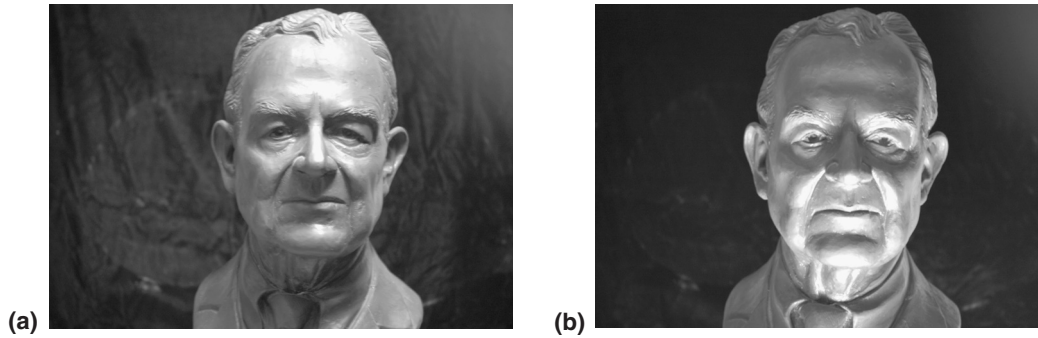
Photo 5.8   Two photos of the same bust illustrate (a) the natural effects of lighting from above and
                   (b) the unnatural look caused by lighting from below. Note how this difference in lighting
                   appears to change facial expression.

SOURCE: Reprinted with permission of Don Everhart.

Theater people recognized this principle long before the advent of television. Traditionally, stages had been lit from below, with footlights, but by the 1820s, when more powerful gas lights replaced candlelight, theater critics began to note the advantage of the chandelier. Chandeliers threw light on the faces of the actors from above, which seemed more natural. Strong footlights, on the other hand, inverted the natural shadows of the face and distorted actors' expressions.

As another example, think of children playing with a flashlight, scaring one another by aiming the light up at their faces from below their chins. Such lighting appears unnatural because it reverses the normal pattern of light and shadow on the face, subverting our normal expectations, at times creating monstrous effects. Photo 5.8 illustrates this phenomenon.

In addition to being generally located above us, the sun is also millions of miles away, and its light passes through all of the Earth's atmosphere before reaching us. As a result, some light is diffused, having been deflected repeatedly at odd angles. It therefore strikes objects in our vicinity on all sides, reducing harsh shadows. Even when the sky is extremely clear, objects rarely appear illuminated on only one side and utterly dark on the other. Rather, they appear illuminated on all sides, but with the sunward side more brightly lit than the others. On overcast days, the directionality of the sun's light can be completely eliminated, making all the light we see appear diffuse and directionless. Under such conditions, objects may appear to be illuminated evenly on all sides.

In summary, sunlight provides both the main source of "hard," directional light from above—the **key light**—as well as "softer," more diffuse (less directional) **fill light** that reduces harsh shadows throughout other parts of a scene. This arrangement constitutes a naturalistic lighting scheme. You can simulate naturalism

by following this simple rule: *In the absence of compelling reasons not to, use lighting designs that imitate the way objects are lit in nature.*

Following this rule is not as easy as it sounds, for a number of reasons. First, in designing light plots for television, we cannot simulate natural light using a single instrument. We must use more than one. When a single light shines on a subject from nearby, it creates unnaturally sharp shadows since the light does not have enough distance to diffuse adequately through the atmosphere before reaching the subject. That is why designing lighting schemes is *always* a departure from "reality," even when the program is nonfiction and the artistic goal is realism.

Second, when natural shadows extend from objects on a bright day, we see *only one shadow* for each object. Duplicating this effect is difficult when lighting for video because we often use more than one light per object, and *each time we aim a light at something, we create a shadow somewhere.*

Third, in nature, the *direction* of shadows cast by objects in our field of view is consistent. That is, shadows are always cast on the side of objects opposite the sun. If a shadow from one object is cast from left to right, then shadows for all objects in the vicinity should also be from left to right. In addition, the shadows will be parallel with one another since light rays from distant light sources such as the sun are parallel. Therefore, when we use multiple instruments to light a set, we must ensure that the shadows seen on air are cast consistently, or we can quickly break the illusion.

For all these reasons, *controlling shadows is as critical a part of lighting design as controlling light.* To do this, you must know not only where the set pieces and the talent are with relation to the lights but also where the cameras are. You must also know how much of the scene the widest shot includes. Knowing the extent of the widest or *master* shot enables you to plan lighting schemes that direct unwanted shadows either off the set or beyond the reach of the cameras. Conversely, using the same principles, you can also direct shadows onto parts of the set where they are needed. Let the program purpose and content dictate these decisions.

Naturalistic lighting provides an attractive, visually satisfying, sculptural appearance of the talent and objects seen on camera, enhancing the sense of depth for the viewer. It is especially useful for stationary talent in limited performance areas in programs such as news, sports, public affairs, information, interview, talk, and audience participation (quiz and game) shows.

A Sample Naturalistic Light Plot

Let us apply the principles and use the equipment mentioned so far to light an actual program, a simple, two-camera interview program for two stationary on-air talents, a host and a guest-author.

Figure 5.5 shows a rough floor plan of the program. Notice that the talent are in the same relationship to each other as Jay Leno or David Letterman would be
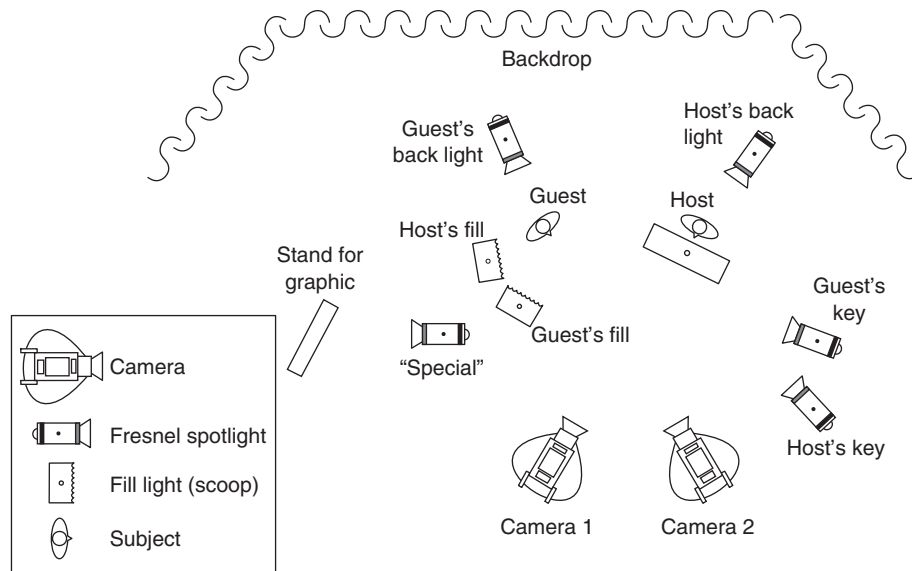
Figure 5.5   Floor plan/light plot for two-person stationary talent interview segment.

with an interview guest. The host is seated behind a desk with a microphone positioned in front. The floor plan also shows the location of two cameras, a backdrop, and a stand for a program graphic—in this case, probably a book jacket, since we are interviewing an author.

The backdrop in this case is a stretch of black fabric extending around the perimeter of the studio, from the floor to the top of the set space. Alternatively, we could use a **cyclorama** (or *cyc* for short, rhyming with "bike"), which consists of a nonblack continuous seamless opaque fabric similarly stretched around the perimeter of the studio, creating the illusion of endless depth. Cycs are often gray and may be lit with colored strip lights to create attractive backgrounds. In some studios, instead of fabric, the cyc is a smooth plaster wall, sometimes called a *hard cyc.* Cycloramas provide a smooth, unobtrusive background for the talent. When a black backdrop is used, only the talent, chairs, and desk are seen since black is invisible on television.

Our goals in naturalistic lighting will be to flatter the talent and to eliminate spurious shadows that might distract the viewer from the talk. First we determine which camera will capture shots of just the guest in close-up (the guest's *one-shot*) and which camera will carry the host. After seating the guest on the left, we decide that the guest's one-shot will be carried by Camera 2, as shown in Figure 5.5. We select Camera 2 as the guest's principal camera because Camera 2 is positioned to get a fuller front-face shot of the guest than Camera 1, which can only get profile or three-quarter guest shots. For the same reason, we use Camera 1 for the host's one-shot.

This arrangement is called *cross-shooting* because the imaginary lines from the cameras to their assigned talents cross one another. If we had used Camera 2 for the host and Camera 1 for the guest, we would have been *parallel shooting.* Parallel shooting, which provides profile and three-quarter images of each person, would have given us less intimate images. For an interview program, cross-shooting is better.

Now that we know where the cameras are with respect to the talent, we can set the lights. The key lights, with the most directional and concentrated beams, are the hardest lights on the talent. The guest's key light is positioned above and in front of the guest. It angles downward at roughly a 45-degree angle. It is also set at about a 30- to 45-degree horizontal angle from the imaginary line between the guest's head and Camera 1. The same is done for the host's key light.

These angles are a rough rule of thumb, a starting point. The vertical angle simulates sunlight, but after all, as the sun passes through the sky, it changes its angle. Therefore, we can feel free to position the lights to maximize the flattering effect we are trying to achieve. For example, if the guest is an attractive actress, a starlet, it makes sense to go for the beauty shot. We may start with a 45-degree vertical angle and see what improvements we can make by departing from that angle. Bone structures differ from person to person, as do program purposes, so it's a good idea to experiment and check the effects by looking at the line monitor.

As the brightest source of light, the key light casts the sharpest, darkest shadow on the opposite side of the guest's face (especially below the nose and chin and onto the neck). To soften this shadow, we position a fill light on the opposite side of the talent, also at horizontal and vertical angles of about 45 degrees. The fill light is more diffuse than the key light and less intense. Therefore, we may need to place it closer to the talent to achieve the right intensity. The purpose of the fill light is to reduce unnaturally sharp shadows made by the key and to illuminate the rest of the guest's face. Together, the two lights should provide a nicely sculpted image for the camera; as a lighting designer (LD), it is your job to achieve that effect.

Finally, to create the illusion of depth and to separate the image of the talent from the background, we use a **back light** to illuminate each talent's back, especially the head and shoulders. This is done by positioning a light directly behind each talent, aiming toward the camera but tilted down at about 45 to 60 degrees from the horizontal plane. It is common to tilt the back lights down toward the floor at an angle as great as 60 degrees to reduce the chance of spilling light into the camera lens. Since the back light is aiming in the direction of the camera, the extra angle is justified. To further guard against sending incident light from the back lights into the cameras, we will use spotlights with barn doors. (If you have a choice, *never use a scoop light or broad as a back light.*)

This arrangement of key, fill, and back lights on each talent constitutes a **three-point lighting** scheme and completes the basic lighting job. Three-point

lighting is the bread-and-butter arrangement for stationary talent in video production. It should provide a natural, aesthetically pleasing presentation of the subject. Notice the triangular relationship of the key, fill, and back lights. Notice also that each talent's principal camera (the one that gets each talent's one-shot) is positioned between each talent's key and fill lights.

As shown in Figure 5.5, we have used a three-point lighting scheme to light each talent separately. That is, we have six lighting instruments. It is possible that, with slight adjustment, one set of lights may be enough for both talents since the guest and host are stationary and close together. The advantages of using only three instruments would be that we would use less electricity, set up in less time, and provide consistency in light locations (since both talents would receive their key light from the same place). However, disadvantages might include a lack of coverage if the guest shifts around and an increased risk that the host could cast a distracting shadow on the guest if the host moves between the guest and the key light. These disadvantages generally outweigh the advantages, so the professional approach is to use separate key, fill, and back lights for each talent whenever possible.

To determine whether the lighting is satisfactory, examine the line or program monitor, which should be checked for each camera before show time; do not trust the way things look to your eyes through direct observation. When you check camera shots on the monitor, make sure you have acceptable coverage for the talent and the set. Look for *specular highlights* (areas of extreme brightness) or unwanted shadows.

Eliminating Unwanted Shadows

Let's assume that after setting up the three-point lighting scheme shown in Figure 5.5, we found unwanted shadows on the backdrop. How could we eliminate them? There are various solutions:

• We might wash out the shadows by shining additional lights on them. This solution is not usually recommended, though, because it uses additional lighting instruments and more power.

• Another way might be to reposition the lights, placing the key lights higher than 45 degrees, causing the shadows to fall on the floor outside the range of the camera. However, this is often murder on the talent since it lights them from a higher angle, elongating shadows on faces, especially below the nose and eyebrows.

• A better solution in most cases would be to move the talent further from the background and then reset the lights.

Usually, unwanted shadows can be avoided by placing talent no closer than 6 feet from the backdrop or walls of the set. Since most people are less than 6 feet tall, this is a good rule of thumb, even for standing talent, especially if you keep the angle of attack of the lights at around 45 degrees.

We are not finished with our lighting job, however, until we have lit the book jacket for an insert shot during the interview. The light for the book jacket is known as a *special* since it performs such a singular function. Figure 5.5 shows the location of the special to the right of the stand, following the same rule of 45 degrees described for the talent. We could have placed the light for the graphic on the other side of the stand, but that might bounce reflected light from the graphic onto the set, causing unnecessary glare or hot spots.[1] We might also have placed the special light directly over the camera, but that would have increased the risk of bouncing unwanted light from the book jacket into the camera lens. Instead, our placement of the special sends unwanted reflected light off the set and away from the camera, thus lighting the book jacket without causing unnecessary problems.

Finally, if we used a cyclorama as background, we might wish to light it with some scoops or colored strip lights. (Figure 5.5 does not include this option.) Whatever lights we might use on the backdrop and other peripheral set areas, they should be separate from the lights used on the talent areas. The reason is that sets and scenery are usually more reflective than talent and costumes, so the intensity of light on them must be kept lower. Furthermore, since talent action is where the main interest most often lies, the talent generally should receive the most light. Lighting set and talent areas separately becomes even more important when performers move around since it becomes more difficult to keep annoying shadows out of camera range.

DEPARTURES FROM NATURALISM

Naturalistic lighting, as we have described it, provides the **base light,** that is, the light needed for basic visibility. It should also provide a sculptured, attractive look to talent and a sense of depth for the talent and sets. However, there are times when departures from or additions to naturalism are justified. This section considers some of the more compelling reasons to break from naturalism.

First, video, more than any other visual entertainment medium, relies for emphasis on the close-up. The close-up, as one network lighting designer put it, is the "money shot." Even sports programming now employs longer lenses and image stabilization systems to get more close-ups. In fact, some feel that even with the advent of HD and larger screens opening the possibility for a shift to a more cinematic style, featuring more panoramic and wide-angle long shots, the close-up will continue to be the most important shot in video. Hence, it is the appearance of the talent in close-up that is often the primary consideration. If the talent's appearance is improved by deviating from naturalism (for instance, by departing radically from the standard 45-degree angles), then the director may want to do so.

Second, the standard naturalistic angles can be hard on talent. While there are 24 hours in a day, only a few of them are the "magic hours" that photographers

and video producers talk about—those hours when natural light comes from low-angle directions. It is sometimes desirable, therefore, to use lower lighting angles to get more pleasing effects. While lower angles do cause more shadow problems, these can usually be solved by careful placement of lights and by enlisting the help of the set designer and director. For example, if a low key light used to improve the talent's appearance causes an unwanted set shadow, the shadow may be hidden from view by the talent's own body.

Third, people don't always want to see only what is normal when they watch video. Normal is what is out the window, but special is on television. In many cases, therefore, people on video are made to look better than they might look in person, just as skies may be made to appear bluer. In short, everything may be made more attractive (or even uglier) than normal to drive home an emotional point.

Additional departures from naturalism may be dictated by the program genre. A horror story may use multiple shadows, lighting from below, as well as bizarre colors, intensities, and other special effects. In an outer-space saga, not surprisingly, other-worldly lighting may be wanted. Light and shadow can be used for dramatic emphasis, as when a climactic point is reached in a drama and the lights are killed everywhere except in one spot. Some videographers may even resort to unnatural lighting schemes just to give a distinctive look to their talent or show. All such lighting decisions should be based on the meaning of the work.

Finally, from a purely tactical perspective, some production formats militate against using naturalistic lighting schemes, especially those featuring moving talent in multicamera settings. Programs in this category commonly include situation comedies, sketch variety series, dramas, and soap operas. These programs intercut shots from several cameras in different locations, perhaps all shooting the same performer in the same performance area from different angles. Seeing cuts of the same set area or performer from different camera angles may be too jarring if highly discrepant light intensities are used. For this reason, instead of naturalistic light, a "flatter" lighting scheme is warranted.

Flat Lighting

The renowned cinematographer Karl Freund introduced a **flat lighting** technique for the *I Love Lucy* series in the 1950s. The program's producer, Al Simon, approached Freund and asked if he could "film with three or four 35-mm cameras, in front of an audience, like a stage play, without stopping, resorting to retakes only under the most dire circumstances." Freund responded, "You can't do that. Every shot requires different lighting. You couldn't photograph three or four angles at the same time and come up with a decent piece of finished film" (Andrews, 1985, p. 49).

Despite his objections, Freund developed flat lighting to deal with the problem. In order to cover talent action over almost the entire set, Freund made the

light intensity uniform over the total area at all times. Set illumination was mostly from overhead. The only light from a lower level came from a portable fill light mounted just over each camera. With overhead lighting, cameras could dolly over the studio floor unobstructed. Cuts could be made from one camera to another without jarring differences in light.

Freund's system of flat lighting is still in use today, as evidenced by the use of such lighting for studio scenes in programs such as *The King of Queens* and *The Office.* In multicamera productions, the most compelling reason to use flat lighting is to minimize light-level differences when cutting between cameras shooting the same scene from very different positions. However, this does not mean that fill lights are the only acceptable tool. Spotlights may still be used for acting areas and smaller set spaces.

MOTIVATING LIGHT SOURCES

Some scripts refer to special light sources indicating time or place, called **motivating light** sources. Motivating sources may include different types of natural light (early sunrise, midday, sunset, cloudy daylight, moonlight) or artificial light (lamplight, candlelight). More exotic effects such as lightning are also motivating sources. The illumination provided in simulating such sources should be convincing but should not draw attention away from the main point of the action. The following sections offer techniques for creating some of the more common motivating light effects.

Sunlight and Sunset. Aim a highly directional beam—uncolored light from an incandescent lamp—onto an acting area or an essential piece of scenery. It should be the brightest light on the set. Use amber gels of varying grades to indicate sunset, and vary the angle of attack to match the angle of the setting sun. If more than one instrument is used for this effect, they should be parallel. The best instrument to use is a powerful concentrating instrument mounted far from the set. A follow spot or a high-powered spotlight is a good choice. If a projector is used, the spread of the beam may be controlled with a funnel, which is a cylinder fitted over the light to control unwanted spill. Use dimmers to control changes in brightness.

Moonlight. Moonlight may be rendered like sunrise and sunset, except for adjustments in intensity and color. Adding a steel blue gel with a color temperature comparable to moonlight will normally suffice. Aim the motivating spotlight at the acting area. On the other side, use spotlights in the flood-beam setting for fill, outfitted with a lighter blue gel at lower light intensity.

General Daylight. This requires a virtually shadowless, broad, general source. It should appear as light coming in from all directions. Directional light is to be avoided. Intensity should be uniform. Color regular incandescent fill lights with light steel blue gels. A large reflecting screen can help create the look of light

entering through a window, as can several small floods equipped with gels of the same color. Imitating changes in daylight from dawn to sunset can be managed by progressive addition of light blue to violet to steel-colored gels. For an extremely hot day, simulate general daylight with light amber.

Fixture Lighting. In most cases, lighting fixtures that appear on camera, such as table lamps in an interior scene, are used strictly as motivating lights. Unless they contribute something dramatic, they are not used as major lighting devices for the acting area. To reduce hot spots, keep the wattages in the fixture lights to a minimum: 25 to 40 watts are usually sufficient to add a necessary accent to a scene. Light the acting areas from hidden sources.

On the other hand, fixture light can occasionally add useful illumination to a scene. Such lights are called *practicals.* An example of a practical light would be a lamp over a music stand to help the performer see the music. Frequently, the location and reflective power of the scenery will influence the use of such fixtures. To control intensity in these cases, use a dimmer. Another way to control fixture light is to cut away the back of a lampshade (on the side away from the cameras) to increase the intensity of light falling on a piece of scenery without letting the light spill directly into the camera's view.

LIGHTING IN MORE COMPLICATED CASES

How can you apply the basic principles of lighting to more complicated productions, say a sitcom or soap opera? Lighting for drama or comedy is a challenge because such programs feature talent moving through and interacting with the set, and they often require the use of motivating lights as well as lighting changes to indicate different times of day. Here are some guidelines:

Meet first with the director and the rest of the creative team, including the producer and the scene and costume designers, to study the script, floor plan, and talent needs. Determine the subject matter, treatment, and tone of the production. Take inventory of the available lighting hardware and become familiar with the space you will light.

From the script and floor plan, determine where the cameras and talent will be, and begin forming a rationale for lighting. Consider how you will provide base light. Then work on providing additional special lighting needs, including motivating lights, and any special instruments. For example, the location of doors, windows, and set pieces will help you decide where to place instruments to provide sun, moonlight, and fixture lights. Let the tone of the program indicate the mood you try to convey, such as whether the lighting should be festive or somber.

Arrange for unobstructed access of the cameras to all of the locations where they need to go to maximize shot variety. Note all camera angles and light

accordingly to avoid spilling light into the camera lenses. Also note where key speeches or action take place, and make those areas a central focus of your lighting design. In areas where talent come close to the set, such as doorways, fit lights with funnels or barn doors to shape and limit their throw and to reduce or eliminate unwanted shadows (aluminum foil has served well in many such applications). Light the set areas separately from the talent positions to control shadow problems. Remember, it is generally best to keep light intensities on sets lower than they are for talent because sets tend to be more reflective than talent, and the talent is where you want the audience's attention. If appropriate, consider using flat lighting for the acting areas to keep intensities uniform over that space, thus reducing jarring differences when cutting from one camera to another.

When the light plot is complete, use the rehearsal to observe the talent as they move through the set. As they move, judge how they look on the cameras intended to cover them, both in the master shot and in close-ups. Fix any dead areas where lighting is dark and uneven. *Spike* (mark) spots on the floor with bits of masking tape where talent deliver speeches. Observe the talent on these spots and improve the lighting if needed. As the action is covered, keep watching for spots that may be too bright or too dull. Use both a light meter and the appearance of each camera shot on the program monitor to make adjustments: Move lights, tune them, or cover them with gels or scrim to color or soften them. Use all the tools available to you to make the lighting scheme convincing and appropriate to the subject matter, tone, and goal of the production.

When you are satisfied that you have a light plot that does what it is supposed to do, log the location of each instrument on a lighting grid. Note dimmer levels. If any lights are grouped together, note them. This logging of the light plot will help if lights burn out and need to be replaced quickly. The light plot should be complete enough so that if the lighting designer is sick and unable to report to work, the crew member taking his or her place can set lights for the production by referring to the floor plan, light plot, and log.

FIELD LIGHTING

Lighting in the field presents unique challenges. You may decide to use the available natural light if the shoot is outdoors. You may decide to use the available artificial light indoors. Or you may choose to supplement the location's light with lights that you bring to the shoot. If you choose to augment available light, you will need access to a power source. This may mean nothing more than bringing a light kit and extension cords and using wall current at the location. But if wall current is not available, you may need to bring a generator. If you use a light kit, bring extra lamps in case some burn out.

Procedures

Scout the location in advance, at the same time of day as the shoot. Test outlets you may wish to use to make sure they are working, and confirm whether they can handle your power needs. The purpose of scouting is to eliminate surprises.

If you decide to use available natural light outdoors, note the direction of the sun, and keep in mind that it changes as the day progresses. Weather conditions can also change, and this can cause continuity problems if you shoot the same scene on different days. If you use artificial light to offset differences, remember to use the proper light for a color temperature match. If possible, shoot at the same time any scenes that will be viewed together. If that is not possible, you may need to wait for similar weather conditions to get what you want. You may also have to get to the location at the same time on those days, so that the sun will be at roughly the same place.

If you cannot get the cooperation of nature, you may wish to consider changes in the script to accommodate shooting conditions. Obviously, flexibility is a virtue in location shooting. Either way, leave enough time in the production schedule to deal with such contingencies. If you are waiting for a rainy day to do a crucial scene, plan the rest of the shooting schedule so that you can get other things done while you watch the weather report.

If you shoot with indoor lights near a window with sunlight streaming in, shield the window to keep it from throwing off the color temperature, or cover the window with the proper filter to correct for color temperature differences. Similarly, when shooting outdoors, be aware that extremely bright sun can cause contrast ratio problems, making your talent look washed out on the sunward side and underexposed or dark on the opposite side. To correct such problems, you can shield the talent by blocking off direct sunlight with large sturdy cards called *flags* (hope for low wind) or by moving the shoot to the shady side of a building. Or you can use reflectors to fill in and reduce harsh shadows on the talent's face opposite the sun. Seek a solution that brings the picture into a tolerable contrast range.

Remember that the canons of lighting do not change from studio to field. Control of light and shadow is still the goal. If you are striving for naturalism, light from above, and control intensities and shadows. Finally, be sure to set white balance for the camera(s) you are using each time you change location or lighting so that the color rendition of your video image is acceptable and consistent from setup to setup.

Equipment

Field lighting requires the use of some unique equipment. Among the tools used in the field are portable lights; light stands; booms, clips, and braces; and flags and reflectors.

Photo 5.9   Some of the typical contents of a field lighting kit: portable lights clipped to their
stands, reflector umbrellas, a flag (the black circular item to the right), a white
balance card, filters (three are visible leaning against the card), and extension cords.

Portable lights offer several advantages over studio lights when doing remote
shoots. First, portable lights are lighter in weight than studio lights. Second, they
use normal wall current and do not require any special adapters to plug into nor-
mal wall outlets. Third, they come in kits that provide custom-designed stands for
the lights so that they are easy to use. In fact, much of the equipment designed for
field use is also used in studios because it is convenient. Photo 5.9 displays the
basic elements of a field lighting kit.

Light stands, depending on the brand, enable you to raise lights to heights of
up to 15 feet or lower them to about 2 feet. The stands are light in weight and
retractable for easy storage. For especially tight spots, clips and braces are avail-
able for mounting lights. *Booms*—long, movable arms—can be rigged to make
lights available in set areas where it is not desirable to see the light stand in a shot.
Flags, as mentioned earlier, are clip-on black cards that attach to stands that can
be placed in an area to block light from entering the set or camera. Conversely,
reflectors may be used to increase the effects of sunlight on a subject by creating
fill light for the side of the subject opposite the sun. Some reflectors are shaped
like umbrellas (those made for artificial lights), while others are simply flat cards
with a foil or highly reflective white surface.

A special outdoor light made with metal halide material is worth noting. Called an **HMI lamp,** this type of Fresnel lighting instrument provides light in the color temperature range of about 5,000 to 5,600 K, making it suitable for simulating daylight, which spans from about 4,500 to 6,200 K.

A great advantage of HMI lamps is that they do not get as hot as incandescent lights, chiefly because they work in concert with a *ballast* that serves to limit current through the lamp. HMIs are most often used in high-end electronic field production (EFP) and film productions. The latest versions of HMIs provide four to five times the illumination of an incandescent lamp of the same wattage. Among the disadvantages of HMIs is that their ballasts, which can be quite heavy, can produce a noticeable hum.

KEY TERMS

light plot	106	fill light	118
lighting grid	107	cyclorama	120
dimmer board	108	back light	121
Fresnel spotlight	109	three-point lighting	121
light meter	113	base light	123
waveform monitor	113	flat lighting	124
vectorscope	115	motivating light	125
naturalism	117	HMI lamp	130
key light	118		

QUESTIONS FOR REVIEW

Name the standard items of lighting equipment found in a television studio.

Beyond providing visibility, what else can lighting do to enhance a video presentation?

How can understanding naturalism guide the lighting designer in planning lighting designs for television?

What aesthetic considerations and physical constraints justify departures from naturalism in planning lighting designs?

Sketch out some ideas for lighting an indoor basketball game. What could you do, for instance, to reduce problems caused by the highly reflective floor? How would you deal with the color temperatures of the lights provided at the arena?

NOTE

1. Of course, a book shot will more than likely be supplied by a computer, but then we'd miss an opportunity to talk lighting strategy.