BASIC DESIGN THEORIES FOR THEATRICAL LIGHTING AND ITS APPLICATION

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Basic information on lighting theory and the equipment necessary for the design of theatrical style lighting in multipurpose facilities such as theaters, churches, and other performance spaces.

2019 EDITION

Published by:

MainStage Theatrical Supply, Inc.

Wisconsin
Florida
Tennessee
Texas
Louisiana

888.936.7697

This brochure is offered free of charge in printed form. It is also available in PDF format from the Mainstage website, www.mainstage.com.

DESIGN CONSIDERATIONS

Lighting a space indoors for the presentation of plays, musical reviews, church services or even a speaker at a podium requires some knowledge of the basic theories of stage lighting. The selection of lighting equipment can only occur after the following theories are applied to the specific performance space.

GENERAL LIGHTING THEORY

Indoor theatrical lighting is designed to emulate the natural highlights and shadows created by the sun and, similarly, the sun's refection off the moon. Without these highlights and shadows the human mind will sense incongruity in the lighting of an object and attempt to correct the view by refocusing the eye. Eventually, both will tire and lose interest. Once this occurs, the eye will seek other stimulation, resulting in not only the loss of visual contact, but also audio contact since a person tends to look and listen to what draws the most attention. Proper highlights and shadows, at sufficient light levels, will maintain longer eye and audio contact which keeps the audience's attention focused on the event.

THE BASIS FOR THEATRICAL LIGHTING THEORY

The sun strikes the northern hemisphere at a relative 45-degree angle producing specific highlights and shadows that the human eye is conditioned to consider normal. We therefore expect to see this angle of light reproduced indoors when a normal lighting look is desired.

The extreme intensity of the sun creates a strong highlight on one side of a three-dimensional object. When lighting indoors, a primary set of lights are used to emulate this function of the sun and are often called Key Lights. The sun is so intense it generates a great deal of reflected (or fill) light off the surfaces surrounding the three-dimensional object. This reflected light fills in the shadows created by the key light at a reduced intensity. The lights used to emulate this refection are often called Fill Lights.

The color of light from the sun is white and is considered warm and dominant. As sunlight reflects off a surface adjacent to an object, it picks up the color of that surface and fills the shadows on the object with the colored light which appear less bright and cooler in relation to the direct sunlight. This natural occurrence is the basic justification of colored lighting for theatrical productions. It would be easy to simulate the sun and corresponding shadows indoors if there was a lighting fixture that could produce the same intensity as the sun. Unfortunately, such a fixture is not available so we must use multiple lighting fixtures to simulate the sun's brilliance and reflected

coloring in an indoor setting.

The moon provides a similar source and angle of light but there are some significant differences between sunlight and moonlight worth noting. Moonlight is less bright by nature since it is reflected sunlight, thus it lacks the intensity to create the same level of bounce or fill light. An increase in contrast between the primary light from the moon and the corresponding shadows is seen because of this reduced intensity of fill light. Any reflected colors are significantly muted or non-existent.

THEATRICAL LIGHTING THEORY

Straight on Viewing

To duplicate the sun's highlights and associated bounce light indoors, we must provide a minimum of three lighting instruments to produce the same 360-degree coverage produced by the sun: one fixture must be used to create the highlight (the key light) and two fixtures must be positioned to create the associated fill light. Though positions can vary, a basic design would include one fixture placed at a 45 degree angle above and 45 degrees to one side of the object; this would be used as the key light. (See Figure 1).

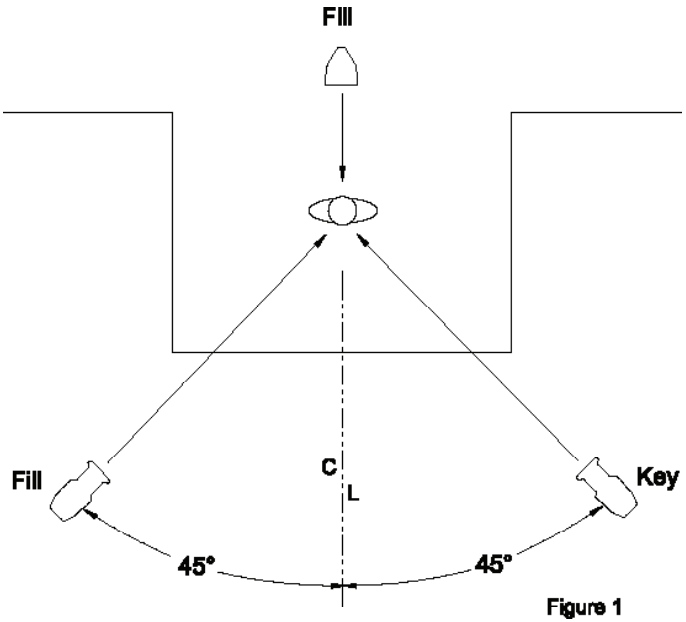


Figure 1

The second fixture at the same 45-degree angle above and to the other side would be the first fill light. A third light needs to be placed directly above (downlight) or up to 45 degrees from the rear (backlight) of the object as a second fill light. Positioning the fixtures in this manner can adequately illuminate a three-dimensional object on all sides, providing the highlights and shadows the mind's eye expects to see. The 45-degree angle is not non-negotiable, but keep in mind that extreme angles cause extreme effects (See Figure 2). A flat angle will create a generally shadow-less light, making the person's or object's features appear too even and without definition due to the lack of shadows.

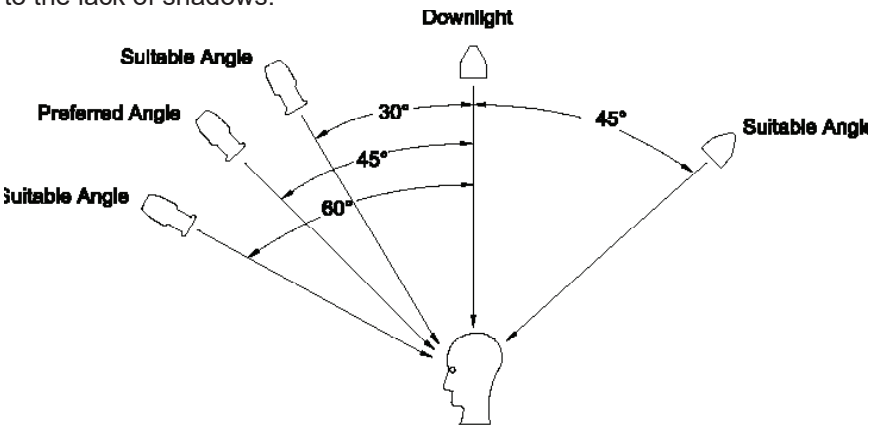


Figure 2

To escape the undefined visual, the mind will work in conjunction with the eye to insert shadows in order to correct the lack of definition, and as described earlier, both will eventually tire and move on to something more interesting. Conversely, an extremely sharp low angle of light from above or below will create exaggerated shadows on the face, which the eye is not accustomed to seeing. For example, a monster effect can be created by lighting a face from below causing reversed shadows and an unnatural look. Although completely different than natural lighting, the mind and eye seem to maintain interest in this lighting longer since it is abnormal and does not require an internal correction of the shadows. The lighting for a night scene should use the same basic 45-degree angle arrangement since the moon is at the same relative angle as the sun. For economic reasons the same fixtures are normally used, but set at a lower intensity with a different dominant color.

Providing more options and colors to your lighting setup will require additional fixtures to be installed using the same principle. First, add back or down lights to increase the number of fill colors from the rear. Next, add fixtures from the front for more key and front fill possibilities.

Multiple View Angles

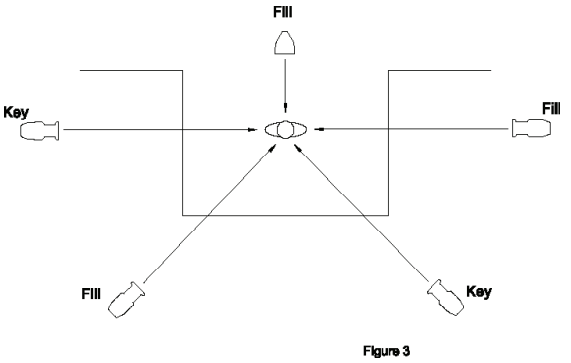


Figure 3

The aforementioned theory is the basic design for one direction of viewing. If there is seating on three sides of a platform the theory remains the same, however the minimum layout of fixtures must increase. Using only two fixtures from the front leaves viewers sitting on the extreme sides seeing either all key light or all fill light, defeating the modeling effect you are trying to create. It is necessary to maintain the key and fill relationship for all viewing angles in order to create the shadows and highlights for modeling the object. A four-light front lighting scheme, with two keys and two fills, provides this necessary relationship for ¾ round seating. (See Figure 3). The number of fill lights from the back remain the same.

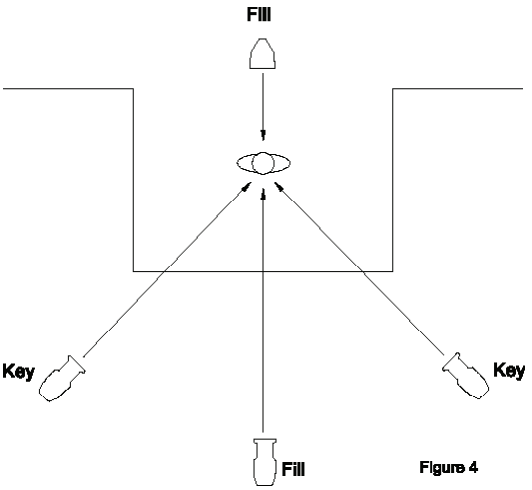


Figure 4

One cost-effective option to the four-light system is the three-light system (See Figure 4). Similar in theory to using four lights, three lights are positioned so that each viewing angle sees a key and a fill light. Two key lights from the sides and a fill light from the front will allow the fill light to perform double duty, acting as a fill from the left for the right-hand fixture and a fill from the right for the left-hand fixture. It also provides each viewing angle with a key light. This method provides correct modeling but does not allow directional control of the colors. For example actors could reference the moon coming from house left, yet the highlight is aimed from both directions.

Expanded View Angles
Additional viewing angles will require more fixtures using the same methods. Other positions can be used to enhance lighting effects while still maintaining the theory-dictated parameters. Since bounce light radiates 360 degrees from the source, fixtures that act as fill lights can be hung in any position in relation to the key light. For example, lighting from a low side position can act as appropriate fill light and provides excellent modeling of the body. This position is often used in lighting for ballet to enhance the dance movements.

COLOR THEORY

Incandescent Lighting
Once the angles are chosen for illumination the next design element is color selection. Humans, either from natural or artificial lighting, have been conditioned to associate certain colors of light with specific times of the day. Although it is actually white light, the sun in considered yellow or light amber due to its yellow appearance in the sky. Most people associate a middle to dark blue color with night. The eye has the most difficulty discerning this color since it is higher in the color spectrum. Because moonlight is less intense and harder to see in than sunlight, dark blue colors are easily associated with moonlight (even though moonlight is actually white). Red is connected with fire, although fire can include the full spectrum of light. These ingrained color responses allow the theatrical designer to light indoors while simulating outdoor lighting moods

Traditional theatre lighting fixtures are manufactured with a holder that accepts thin plastic color sheets, originally made of gelatin, called gels. Although gels are available in hundreds of shades, the selection and application of color is very difficult to learn, even with a book or technical manual. Given that sheets of gel are relatively inexpensive, trial and error can be the best method for finding the colors that will suit your purposes.

Ideally, the correct selection of basic key and fill colors will emulate the sun or moon. The key color should be warm like sunlight and the fill should symbolize a reflection of sun from the surface behind the object which typically is cooler than the sun, like gray concrete, brown wood or green leaves. A good rule of thumb for basic lighting set ups is to choose a warm and cool color with similar color intensities. A brilliant yellow light would seldom produce a dark blue reflection; however, a deep lavender key could produce this reflection. When using multiple key and fill angles, it is possible to select gel colors which act as both a warm and cool light. For example, when using three angles of front light, a rose tint could be used from the right, light lavender in the center and a medium blue from the left. The lavender would look cool when compared to the rose, yet warm when compared to the blue. Potentially, the medium blue raised to full intensity could become

the warm against a very low-intensity lavender. During a production with many parts, the entire color look of the light could be altered from scene to scene while still maintaining the basic lighting theory.

Gel colors must also be selected with scenery and costumes in mind. White light is a combination of the primary (red, blue and green) and secondary (magenta, cyan and yellow) colors of light. These colors, also referred to as wavelengths, are necessary for viewing pigment colors. Pigment is the substance that provides color in objects. A blue fabric has blue pigment and will only appear blue if part of the light that strikes it contains a blue wavelength. Since white light has all the colors of the spectrum, all pigments are excited and look natural under the sun or an un-gelled lighting fixture. When light that contains only a red wavelength hits blue fabric, the fabric will appear as a shade of red (depending on the fabrics makeup of primary and secondary pigments).

True red, being a primary color, contains none of the blue wavelength. Similarly, the fabric would appear green if only the primary green light was shone on it, warm blue if magenta was the only light and cool blue if cyan was used (magenta and cyan being secondary colors that contain blue). The shades of blue will appear different given that we base our “natural” blue color on observance under white light. Removing one part of the light spectrum will make any pigment look different. For beginners, the wrong selection of color can become a great calamity.

The scenery, costumes and makeup can appear completely foreign to the designers and directors because they have most likely been viewing these items under relatively white incandescent light or slightly green fluorescent light. Having the correct colors in the fixtures will keep directors’ and designers’ visions intact, avoiding any potential problems during tech rehearsals.

Using this color knowledge, lighting design can greatly affect the emotion of the presentation. A play’s dramatic turn from depressing to happy could be made even more dramatic if the lighting transforms the entire set from cool to warm. If the scenery was predominantly blue, the mood change can be accomplished by changing the lighting from a cool blue-green light that suppresses the blue fabric color to a blue or violet light that allows (or enhances) the warm natural color of the fabric.

A limited selection of fixtures and colors does not necessarily mean a limited color palette. If your lighting instruments are attached to dimmers, you can change the colors of a single gel simply by increasing or decreasing the intensity of the lamp (light bulb). The light from a lavender gel will become increasingly red as its lamp intensity is reduced. This is due to both the

change of intensity and the shift in color temperature of the lamp.With practice and experimentation, you will learn how colors react to different intensities and how they respond when used together.

LED Lighting

LED lighting fixtures for theatrical lighting are becoming the standard in many new venues. A three, four or seven color LED emitter can provide a large palette of colors from a single fixture. With the ability to dial up any color from the fixture many people are losing sight of the need to remember that all the same theories apply. In order to emulate normal lighting and provide proper shadows, the correct lighting angles and key and fill lighting concepts are still necessary.

With LED fixtures that are color changing additional lighting fixtures may not be required to increase your color palette and you can stick with the simplified layouts; however, with the availability of both key and fill colors within each fixture it is easy to lose those concepts. Always remember to maintain these relationships so that the fill color is in response to the key color.

The colors available from LED fixtures are dependent on the type and color of the light emitting diodes that are used in the manufacture of the fixture. Although most utilize the primary colors of red, green and blue, man-made pigments and dyes are seldom true to the color spectrum. This defect makes it difficult to achieve secondary colors or even all the colors available in color media form. If possible, select fixtures that include additional amber, cyan and magenta LED's, as these will reproduce most colors. Mixing different manufacturers' fixtures may seem like a good cost-cutting process until you attempt to achieve the same color out of different fixtures. Sticking with a line that uses all the same LED colored arrays will allow easy color matching from fixture to fixture.

LIGHTING APPLICATION

The basic lighting theory is applied using standard theatrical equipment. This equipment also dictates the physical layout of the three-fixture theory. What follows is a description of lighting fixtures, their layout and an overview of the equipment that is used to power and control the fixtures.

Determining Lighting Areas

To accommodate interior lighting, we must rely on multiple fixtures since we do not have a fixture that can replicate the output of the sun. The fixtures designed for theatrical use create appropriate light levels when they project a 12 to 14-foot circular beam of light. To illuminate a typical stage many fixtures are needed and the overall area to be lit must be broken down into

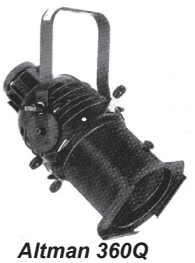
smaller units called focus areas. It is easiest to create 8-foot to 10-foot squares to allow the 12 to 14 foot beams to overlap for complete coverage and even illumination from square to square. For example, if the stage or platform to be lit is 16 feet wide by 16 feet deep there would be a minimum of 4 focus areas using the basic design discussed above. For straight-on viewing, utilize 8 fixtures from the front and 4 fixtures from above or back (one key and fill from the front and one fill from the back per area). If the platform is to be viewed from three sides, the number of fixtures should be modified by adding one or two front lights per area for a minimum of 12 fixtures but still using 4 fixtures from behind.

The same lighting method is used to spotlight special areas such as a single person or piano. In this case, the focus area may be smaller to cover only the specified object, which will affect the fixture selection. These fixtures are normally referred to as "specials."

Determining Fixture Needs

Several types of fixtures are available, so different capabilities and uses must be considered. To achieve proper illumination the fixtures must produce a minimum of 100 foot-candles (an old light measurement based on the illumination of one wax candle) of light on the object in the roughly 12 to 14 feet diameter. This level may seem bright, but the foot-candles will be reduced when color is added to the lighting fixture; how much reduction will depend on the transmission value of the gel, so this minimum output is essential (the darker the gel, the less transmission of light). There are several fixtures that have specific uses and most can utilize various wattage lamps. Once the fixture is selected for the proper distance, the lamp must be chosen for the proper foot-candles. Below is a brief list of the most common fixtures and their uses.

Ellipsoidal Reflector Spotlights (Lekos, Ellipsoids, Source Fours, ERS, 6x9, 6x12, etc.)



Altman 360Q

Ellipsoidal Reflector Spotlights are fixtures that produce a beam of light that is well defined with a hard-edged circular beam. The term is changing to Profile Spots since the LED version have the same lensing but no longer the ellipsoidal reflector. They are normally used for front lighting since there is little spill light coming from the fixture. Spill light is undesirable as it could light up the audience or walls of the space. Also, these fixtures are equipped with shutters used to shape the beam of light. Squares, rectangles and other geometric shapes are formed with shutters. The beam can be cut off the edge of the stage, or wall, eliminating the spill light. Typically, these fixtures are also equipped with a template slot so the beam of light can also be

shaped using patterns (templates, gobos, cookies, etc.). Patterns come in many designs ranging from simple breakups, which add texture to the light, to cityscapes or custom designs.

ETC Source Four Jr. Zoom

These fixtures create a cone-shaped beam of light. When a fixed focal-length fixture is placed at different distances from an object, the diameter of the beam of light directed at the object changes (the further away the larger the beam). The focal-length is a measurement of the lenses in a fixture which determines the size of beam produced. More expensive Zoom versions are available that vary the relationship between the lenses, effectively altering their focal-length. With the expensive versions, the same beam size can be achieved at different distances. Once the location and distance from a focus area are determined, a fixture with the proper focal-length must then be selected.

Scoops (Ellipsoidal Reflector Floodlights)

A fixture that produces a fixed open beam of light and is intended to light large areas such as backdrop or cyclorama curtains. Although Scoops have the same shape reflectors as ellipsoidals they have no lenses to redefine the beam which creates a soft diffused output. Scoops have fallen out of use lately in favor of more efficient Cyc fixtures that are now utilized to light backdrop curtains and cycloramas. Scoops are now relegated mostly to work light functions.

Altman Focusing Scoops

Fresnel Fixtures

Fresnel fixtures are spotlights that produce a very soft-edged beam of light. These fixtures are often used for down or back lighting, although they can be used as front lights if the spill will not be a concern. They are less controllable than ellipsoidals in their focus because they have no shutters or template slots. Barndoors can be added in front of the lens of these fixtures and will eliminate some of the spill light, but the Fresnel lens will always create spill and can never be completely shaped by the barndoors. These units are variable-focus fixtures by moving the lamp in relation to the lens which changes the diameter of the beam, making them very flexible. Fresnels are the recommended choice for small systems and some touring situations because they cost less than ellipsoidals, can be placed at different distances and still achieve the correct beam size. LED versions are available using white emitters with a handful of new fixtures being developed with color-changing emitters.

Altman 65Q

PAR Cans

These fixtures are an addition to theatrical lighting from the Rock & Roll business. They are housings that hold lamps similar to an old car headlight. The lamps produce an intense oval-shaped beam that has a fixed beam spread. Because PAR lamps include the reflector, filament and lens in one unit, the lamps determine the width of the beam, not the fixtures. They are used for intense back lighting, but they can also be used for front lighting when spill light and the shape of the beam is not an issue. The only way to create a wider beam from a fixed position is to replace the lamp. Lamps cost between $30 and $55, so this can be an expensive stock item. The modern additions to the PAR fixture line are energy-efficient lensed units. ETC first introduced a theatrical version called the Source Four PAR. This unit uses the popular HPL lamp and has a fixed reflector with interchangeable lenses. To create different size beams the reusable lens is changed at a cost of approximately $4. These lenses are available in the same beam spreads as the PAR lamps.Many new LED fixtures have been introduced that have replaced the traditional PAR. These LED Wash lights provide all the color changing advantages and the beam size can be altered through plastic lens or via zoom focusing in the more expensive versions.

Altman PAR 64

Source Four PAR

Borderlights (Striplights)

These units are continuous rows of lamps intended to light a large linear area, usually from overhead. They have also been used to light cyclorama curtains and are typically installed in theaters where they can be concealed behind curtains. This fixture has three or four alternating colors and can easily provide separate color washes from above. However, each color is controlled as one big area that cannot be isolated into smaller areas. Because of cost, electrical efficiency and reduced availability of lamps, these fixtures are rapidly being discontinued and replaced by Fresnels and Broad Cycs for down lights, back lights and to light cyclorama curtains. There are linear LED fixtures also available that could act as a replacement.

Altman R40

Broad Cycs

This style of wash light produces a fixed open beam of light and is intended to light large areas such as backdrop curtains and cycloramas. Broad Cycs are somewhat like Scoops, but they have a specifically designed reflector to produce a square shaped beam that collects more,

L&E Broad Cyc

and projects a greater level of, light onto a curtain with significantly better energy efficiency.

Followspots

Followspots are fixtures that are physically controlled by a person. They are mounted on a stand that allows the operator to follow a performer with a sharp-edged beam of light. The beam can vary in size, and the fixture generally includes six or more colors. They are available in many sizes and intensities to match any throw distance. Although they are normally used from the front, alternate positions from above can produce interesting highlights on the performer. This is the only sure method to follow a performer, especially while he or she is dancing or moving rapidly. Some versions incorporate electronically controlled iris and color changing, which can be remotely controlled by any DMX control console. This allows preprogramming of the critical changes and allows the operator to focus on only aiming the fixture to match the actors' movement.

Altman Comet

Moving Lights

Moving lights include a wide range of fixtures that are controlled remotely. Each unit contains dichroic filters or color mixing modules so the colors can change on demand. The beam sizes are automatically variable and multiple patterns can be included in each unit. The fixtures can be used as front lighting, back lighting and special effects.

Martin 350 Entour

LED Fixtures

Several styles of LED fixtures have entered the theatrical lighting world in the last few years. They have just begun to meet the output levels that make them viable alternatives to traditional fixtures. Ellipsoidals, Fresnels, PARs, Cycs and moving light fixtures are all now available in LED versions. The cost for the initial purchase of LED based fixtures is significantly higher than traditional fixtures, but the reduced long-term electrical and lamp replacement expenses can outweigh this large initial investment.

ETC Desire D40

Many LED fixtures on the market have been designed for bar and nightclub use. Although they have moved into the theatrical market, the purchaser should take precautions when buying these units to ensure a wise investment is made. The following are several key points for purchasing LED fixtures.

1. Reliable Manufacturer: Many imported fixtures may seem like a deal, but the quality of the unit will determine cost efficiency. The fixture is made up of a power supply, LED emitters and electronics. LED emitters might be rated for 50,000 hours of use, but the power supplies may not be. In addition, many manufacturers overdrive their LED emitters with a higher voltage to increase light output which shortens the life of the LED's and they may not achieve the energy savings desired. Stick with known manufacturers when selecting these fixtures.

2. Quality Electronics: The electronics portion of the fixture is critical to producing a subtle dimming curve of the light. Many fixtures are designed for bar and nightclub venues where there is no need for a 50 count fade; an example being a long smooth fade at the end of a romantic scene. Many units may fade well at the top end of intensity but the light could appear to be stepping down rather than fading at the lower end. High quality electronics and designs are necessary in an LED fixture to produce good fading curves for use in theater.

3. Proper LED Alignment: Most LED fixtures utilize multiple LED emitters set in a circular or square array. Some of these fixtures position the LEDs to combine to a point inside or in front of the fixture to mix the multiple beams of light before producing the final beam that will be used to light the object. This combination is important since each beam of the emitter has the potential of creating a shadow. If all the LEDs are white, the multiple shadows are not much of an issue since only one color of shadow is produced. If they are individual red, blue and green, then separate red, blue and green shadows will be created and the multiple shadows will be distracting to the audience. Some fixtures use 50 or 60 LEDs to achieve enough output, providing the potential for 50 or 60 shadows. Check the shadows created by the fixture before purchasing.

4. Adjustable Color Tuning: Many imported fixture manufacturers change models every year. They are also known to alter the supplier of their LED emitters without notice. Purchasing 10 fixtures today and 10 more a year from now will probably produce a mixture of hues even when sending the same control signal value to each fixture. This will result in an unbalanced stage look and frustration for the designer and board operator. Quality manufacturers like Altman, ETC and Strand work hard to fabricate fixtures that produce the same colors at the same control values from batch to batch. Many of their fixtures can be tuned in the field by authorized service technicians. It is important to purchase equipment from manufacturers who have a known and reliable track record in this area.

5. Light Output: Buying the fixture with the correct light output is critical. Many suppliers claim that their fixtures work in theatrical environments, yet

some of the less expensive units won't. A good rule of thumb is to purchase an LED fixture of 100 watts, or preferably more, if it is intended to illuminate a single lighting area. Those fixtures designed to be used in groups for cyclorama lighting or large wash areas can be of lesser wattage since the beams will be overlapping. Purchase higher wattage fixtures that will create the appropriate output.

6. Know the Differences: Color-changing LED fixtures produce light by combining the output of primary-colored LEDs (better fixtures include the secondary colors as well) and using a white LED to alter the hues. More light output is produced when all the LEDs are turned on as opposed to when a single color is outputting. Traditional quartz lighting fixtures are always at their maximum brightness when turned on at full power without color, however their light output decreases the moment a gel is placed in front of the lens. The new ETC Source Four LED fixtures are not as bright projecting white light as the original 575 watt quartz Source Four without color. However, if you add a dark blue gel to the original and set the LED to the same color, the LED fixture is brighter. Compare the outputs of LED fixtures to your traditional fixtures to make certain you will have the output you need for your performance space.

Dimming and Distribution

Dimming varies the intensity of the traditional lighting fixtures. The distribution equipment is the set of electrical boxes that contain the individual receptacles the fixtures plug into. For a new facility or portable installation, the quantity and locations of the receptacles and dimming can be designed once the quantity and position of the lighting fixtures are laid out. In general, individual control of each fixture is the most desirable. If this is not possible, group the control of the fixtures by angle and/or color i.e., all front cools that come from the house right direction could work together on the same dimmer. Similarly, all same angle/color warms and then all same angle/color backs could work together. This control method is less flexible but allows you to dim the fixtures by color to change from day to night. Traditional dimming includes a centralized dimmer rack, such as the ETC Sensor, that feeds the distribution equipment. Distributed dimming systems using small dimmer packages that mount adjacent to the fixtures can reduce wiring costs and are excellent for portable systems. These systems include portable packs and the higher quality Strand S21 Dimmer Strips. With the advent of LED fixtures, emitter dimming is done electronically and these traditional dimmers are being replaced with electronically controlled relays.

ETC Sensor Rack

NSI Dimmer Pack

Control

The control of the lighting can be just as critical as the selection of color and fixture angles. How the light changes from scene to scene is an important part of the lighting design and can maintain or alter the continuity of the show. An abrupt change of lighting at the end of a tender romantic scene can destroy the entire mood created by the actors. A good dimming system with a quality control console, preferably computerized for accurate playback, is important to any lighting design. The basic control console is termed a "Preset Console" and has one or two rows of potentiometers that are manually manipulated to set the lighting levels. Some of these units are enhanced with memory that records a full scene for playback from each potentiometer. A "Memory Console" is a custom computer with both a keypad and potentiometers for playback of prerecorded cues. These typically include a monitor for display of recorded information. There are some memory consoles, such as the Jands Vista, that are created by adding software and an output module to a standard personal computer.

ETC SmartFade

Any console purchased should produce DMX512 signal outputs to allow full operation of dimmers, moving lights and effects. The size of console is highly dependent on the number of these devices that may eventually be used in the facility and should be purchased for the maximum number of control channels that will be required. LED fixtures require multiple times the number of control channels since each color of the emitter can be altered separately. A console designed specifically to manage LED fixtures is the best choice for the new technology.

ETC ION

Designing Process - RECAP

This concludes the basic description of the lighting theory and equipment necessary to fulfill the theory for a theatrical style lighting setup. Many factors are necessary to develop a complete setup of this equipment; however, this information will aid you in developing appropriate designs. Below is a short recap of the design and equipment selection process:

1. Design your lighting layout for proper three-point illumination. Break your platform into 8 to 10-foot focus areas. Include any additional “special” lighting areas.

2. From the layout areas, select the proper positions for the lighting fixtures.

3. Select the lighting fixtures to produce 12 to 14-foot beams based on the distance between the mounting and the desired area of illumination. The wattage of the fixture should also be selected for the proper foot-candle distance.

4. Connect lighting fixtures to the dimming system to allow for individual or angle/color groupings. Watch the wattage of your fixtures to be certain not to overload the dimmer or relay.

5. Select the gel or LED colors to give the production the appropriate moods, taking into consideration the scenery and costume colors.

6. Create lighting cues that enhance or direct the mood of each scene, including the timing of lighting changes.