STAGE LIGHTING AND ITS INFLUENCE ON ARCHITECTURAL LIGHTING

A THESIS
SUBMITTED TO THE DEPARTMENT OF
INTERIOR ARCHITECTURE AND ENVIRONMENTAL DESIGN
AND THE INSTITUTE OF FINE ARTS
OF BILKENT UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF FINE ARTS

By
Hüsnü Aydın Özetilgan
June, 1994

STAGE LIGHTING AND ITS INFLUENCE ON ARCHITECTURAL LIGHTING

A THESIS

SUBMITTED TO THE DEPARTMENT OF

INTERIOR ARCHITECTURE AND ENVIRONMENTAL DESIGN

AND THE INSTITUTE OF FINE ARTS

OF BİLKENT UNIVERSITY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF FINE ARTS

By

Hüsnü Aydın Özatılgan

June, 1994

I certify that I have read this thesis and that in my opinion it is full adequate, in scope and in quality, as a thesis for the degree of Master of Fine Arts.

Assoc. Prof. Dr. Cengiz Yener (Advisor)

I certify that I have read this thesis and that in my opinion it is full adequate, in scope and in quality, as a thesis for the degree of Master of Fine Arts.

Vis. Assoc. Prof. Dr. Arda Düzgüneş

I certify that I have read this thesis and that in my opinion it is full adequate, in scope and in quality, as a thesis for the degree of Master of Fine Arts.

Assoc. Prof. Dr. Yıldırım Yavuz

Approved by the Institute of Fine Arts

Prof. Dr. Bülent Özgüç Director of the Institute of Fine Arts

ABSTRACT

STAGE LIGHTING AND ITS INFLUENCE ON ARCHITECTURAL LIGHTING

Aydın Özatılgan
M.F.A. in Interior Architecture and Environmental Design
Supervisor: Assoc. Prof. Dr. Cengiz Yener
May 1994

In this work, fundamentals of stage lighting are analyzed along with their historical and technological background. It is stated that there is an influence of stage lighting on architectural lighting. Consequently it is stated that stage lighting is the basis of architectural lighting and there is an important interaction between them.

Keywords: History of Stage Lighting, Stage lighting, Stage Lighting Equipment, Architectural lighting

ÖZET

SAHNE AYDINLATMASI, VE MİMARİ AYDINLATMAYA OLAN ETKİLERİ

Aydın Özatılgan
İç Mimari ve Çevre Tasarımı Bölümü
Yüksek Lisans
Tez Yöneticisi: Doç. Dr. Cengiz Yener
Mayıs 1994

Bu çalışmada,sahne aydınlatmasının esasları, tarihsel ve teknolojik yönleri ile birlikte ele alınmıştır. Sahne aydınlatmasının mimari aydınlatmaya olan etkisi belirtilmiştir. Sahne aydınlatması ile mimari aydınlatma arasında varolan metodolojik ve teknolojik yakınlıklar ve farklılıklar ele alınmıştır. Sonuç olarak, sahne aydınlatmasının mimari aydınlatmaya baz teşkil ettiği ve ikisi arasında önemli bir etkileşimin varlığı belirtilmiştir

Anhtar Sözcükler: Sahne Aydınlatmasının Tarihi, Sahne Aydınlatması, Sahne Aydınlatması Ekipmanları, Mimari Aydınlatma

ACKNOWLEDGMENTS

Foremost I would like to thank Assoc. Prof. Dr. Cengiz Yener for his invaluable help, support and tutorship, without which this thesis would have been a much weaker one, if not impossible.

TABLE OF CONTENTS

LIST OF FIGURES

1 INTRODUCTION

For centuries, light has been used as a tool to support the communication between the performer and the audience. It became a very important component of theatrical language. Due to this importance, stage has been always dynamic to experience and improve the effects of light on audience. Thus, a large amount of knowledge is accumulated about the usage of light for the benefit of the performance.

Light is a very important element of architectural design as well. To state this importance, Le Corbusier (1970) says that "Architecture is the masterly correct, and magnificent play of masses brought together in light". Today, also the influence of lighting is obvious on the human perception of the environment. In architecture, giving the light same function as in stage lighting, will clear that there are many similarities between architectural lighting and stage lighting. Consequently, methodological and technological transitions from stage lighting to architectural lighting are highly possible.

The purpose of this study is to analyze the stage lighting, and its methodological and technological influence on architectural lighting. Considering the influence of the historical developments on the contemporary technology; in chapter two, the technological and theoretical developments about stage lighting are analyzed from the initial applications until the 20th century.

Third chapter explains the basic types, functions, and the contemporary stage lighting techniques. Furthermore, the objectives of color and its usage in theater are analyzed, and the effect of color on the audience is stated.

Fourth chapter, investigates the contemporary stage lighting equipment. In this chapter, light sources, filters, lanterns and their control gear is studied in terms of both technical properties and their effects on the scenery.

In the fifth chapter, similarities and the distinctions of stage lighting and architectural lighting is determined. The technological and methodological transitions from stage lighting to architectural lighting are explained.

2 HISTORY OF STAGE LIGHTING

Ancient theater used to be performed outdoors. The classic theatron was built in open air, usually on the hillside, and oriented so that the afternoon sunlight came from behind the audience and flooded to the performing area. For the night productions, torches were used to illuminate both the auditorium and the performing area. Roman theaters were also built outdoors, but they were covered with a colored awning that diffused the sunlight. However, it is considered that the history of stage lighting began when the performances moved indoors. According to Brockett (1987) this transition occurred during the fifteenth century, but Stevens (1951) and Barber (1953) state that this was during the sixteenth century.

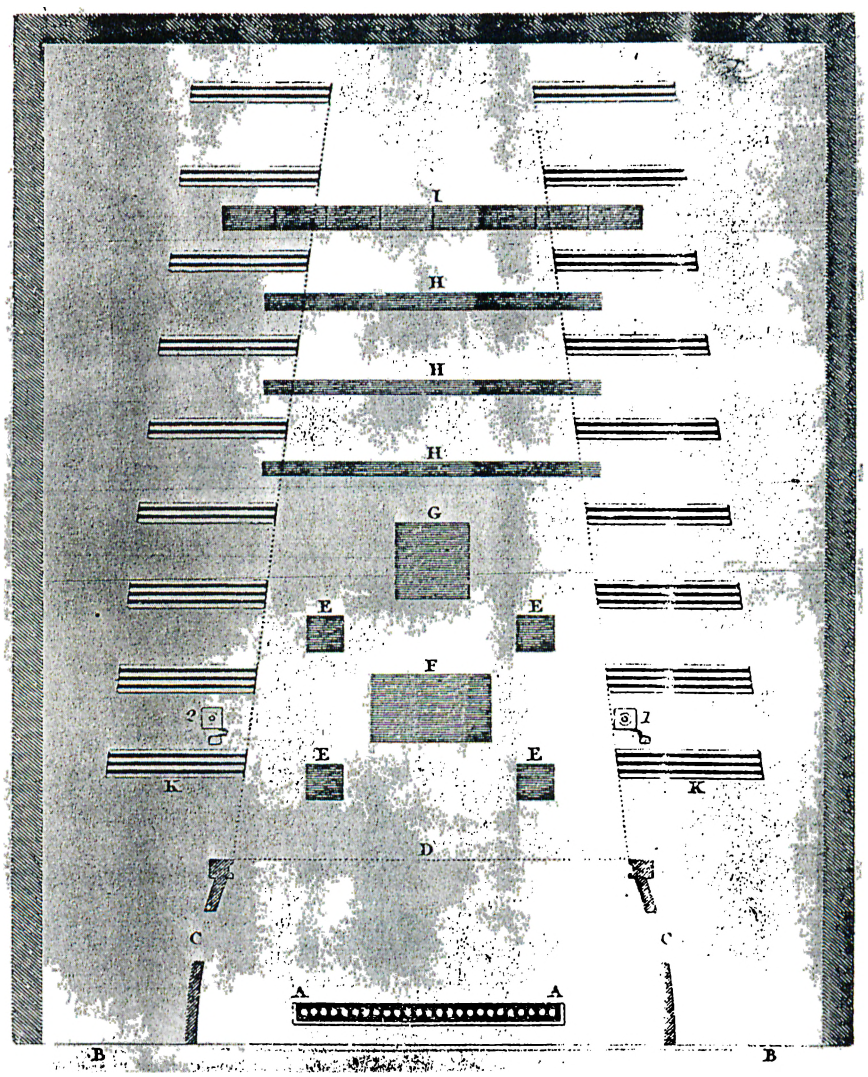
The stages of the 16th century had large aprons jutting out into the auditorium. Stage doors were positioned at either sides of the proscenium. The scenery behind the proscenium was consisted of flat, painted wings that can draw off the grooves. At the far back there were a flat drop with a perspective painting (fig. 2.1). The play took place on the forestage, i.e., the actors were backed by the scenery, but not surrounded by it (Nelson, 1975).

Main light sources were candles, oil lamps and torches that were in full view of the audience (fig. 2.2). To illuminate the auditorium, candles positioned on chandeliers were preferred due to their agreeable odors. Frontal areas of the stage were illuminated by the oil lamps that were consisted of floating wicks in oil and were called as footlights or floats (Brockett, 1987). Side lights, positioned in the wings, were also used to increase the illumination level on the stage (Fig, 2.1)

The application of such lighting techniques were creating some problems. The most common one was the headaches caused by looking into the apparent light sources. It was not until the end of the 18th century that all stage lighting equipment was concealed from the view of the audience. Another problem was haze, heat, and fumes that were caused by footlights and chandeliers (Brocket, 1987).

To increase the illumination level, parabolic or spherical reflectors made of mica or polished metal basins were placed behind the light sources (Brockett, 1987). Another important technological development was the introduction of Argand lamp in 1780 by Ami Agrand (fig. 2.3). It was consisted of an adjustable cylindrical wick that enabled the adjustment of the relative proportions of oil and oxygen. Later a glass chimney was added to achieve a steady flame and brighter source. Agrand lamp gave brighter light and less fumes compared to normal oil lamps. It also brought an additional safety (Nelson, 1975).

Since the beginning of the stage lighting, different techniques were developed to adjust the illumination level on the stage. The easiest way was to extinguish the candles and oil lamps, but it was difficult and awkward to light them up during the play. Second method was to hang an empty tin cylinder (fig. 2.4) or scene blind over the light source and dim the lights by lowering them (Brockett, 1987). The third method was to position the light source over a reel and dim the light by turning it away from the visible part of stage. The last method used to dim the footlights, was to lower them into a conduit. These lights were called as sink lights (Nelson, 1975).



(A) Footlights, (B) theater wall, (C) proscenium doors, (D) proscenium, (E, F, and G) traps in the stage floor, (H, I) grooves in floor for shutters, and (K) wing lights. The wing lights (1, 2) are upright posts , to which is attached "tinned iron, forming two sides of a square, and movable hinges, and furnished with shelves to receive the lamps or candles.

Figure 2.1

Figure 2.2

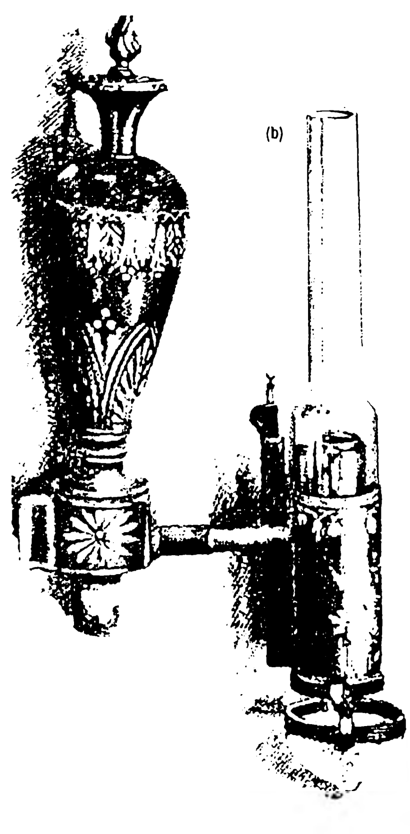


Figure 2.3

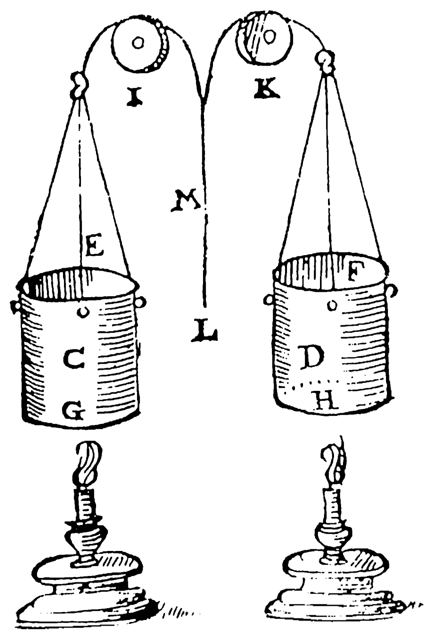


Figure 2.4

Stage lighting at that time was more sophisticated than what it is thought. Light coloring was considered as an important effect. Sebastian Serlios is the first artist who used colored liquids to produce colored light (Stevens, 1951). By the end of the sixteenth century colored silk screens that were placed in front of the luminaries were used and remained as a relevant method for a long time. Some innovative methods were developed to change the color towards the end of eighteenth century. After the introduction of Agrand lamp, the glass chimneys of the lamps were tinted, but this caused a decrease in the illumination (Eddy, 1990). William Pyne describes some lighting effects on the stage in a book, published in 1823 in which he states the usage of stained glass as a color filter (Nelson, 1975).

Lavosier, the French scientist, that contributed the development of Agrand lamp, describes a way to illuminate the spectacles in his "Notes for the Academy of

Sciences". He states that there are three objectives that must be fulfilled in lighting the spectacle hall: to light the actor, to light the stage and the scenery, and to light the spectator. According to his opinion, it is not natural to light the actors from the bottom by the footlights and proposes to light them from sides and top. This method has not been used due to the conventions about the footlights. He also thought to hide the lights and point them towards the stage with parabolic and ellipsoidal reflectors. They were the exact forerunners of stage luminaries used today (Nelson, 1975).

Another important contemporary figure was Pierre Patte. He is the author of "Essay on the Theatrical Architecture" published in 1782. He was concerned with the safety in the theaters. He suggested that reflectored lamps with their increased intensity and directionality could be moved from wings, to the side walls so that they were placed further from the combustible scenery, and actors' costumes. He proposed a small tin funnel to control smoke and provide ventilation. He also opposed to the footlights and suggested to move them to the second, third and fourth tiers of the stage boxes (Nelson, 1975).

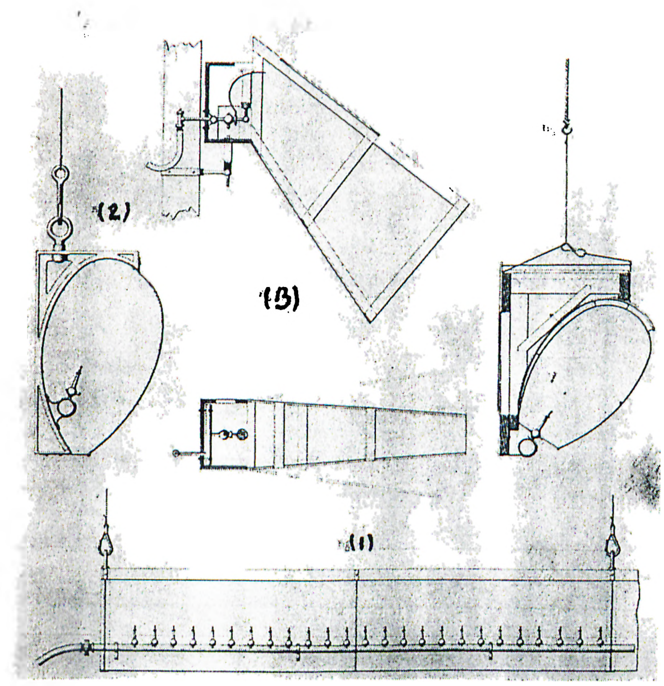
During the sixteen, seventeen and eighteen centuries, stage lighting was a static medium due to the technological limitations. It was in the form of general illumination of the stage and the surroundings (Barber, 1953). Theater people were always thinking to find ways to increase the intensity and to control the light. However the usage of footlights was held as a strong convention (Nelson, 1975).

Invention of gas lighting started a new era in the history of stage lighting. The technology of gas had invented and adopted as a light source by William Murdoch in England in 1792 and it was applied to theater at the beginning of the nineteenth century. However the transition to gas in lighting did not happen immediately, because the gas mains were not installed widely before 1850. (Encyclopedia Britanica). Consequently all theaters had to built their own gas mains (Brockett, 1987).

By the help of gas lighting, an increased level, and control of illuminance was achieved. It was supplying a steady brightness during the show. Moreover it was not dripping wax on the audience and it was eliminating the wicks that had to be trimmed during the show (Nelson, 1975). The primer fixtures were the simple gas burner. The yellow light of the flame was the source of illumination (Encyclopedia Britanica). They were placed together as rows that were equipped with reflectors to control the light direction (fig. 2.5).

Higher level of illumination was achieved by the invention of the limelight in 1816 by Thomas Durmond (fig. 2.6). This burner was mixing oxygen and hydrogen with coal gas and directing this mixture towards a block of lime to heat it to give out a strong and pleasing light. However, it was difficult to manage and each one required an operator. By placing this system inside a hood and adapting a lens, limelight became the ancestor of the modern spot light (Brockett, 1987).

Adapting gas lighting to theaters enabled to place the lights to the places that were hard to reach. Moreover it became possible to change the illumination level by adjusting the gas flow by the help of gas taps. In the beginning, those taps were separate from each other. By arranging them together, it became possible to adjust the gas flow remotely by one operator. This instrument was called gas table and considered as the forerunner of the modern control boards (fig. 2.7) (Brockett, 1987).



Details of gas battens used in the flies of theaters: (1) an iron batten with its burners, (2) a section of this batten, and (3) a movable conical box with its burner and reflector.

Figure 2.5

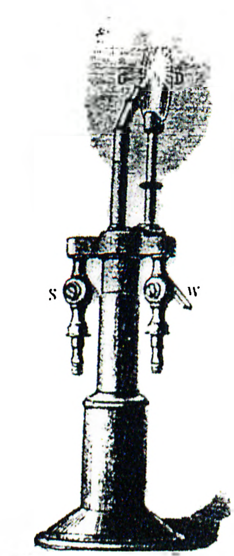


Figure 2.6

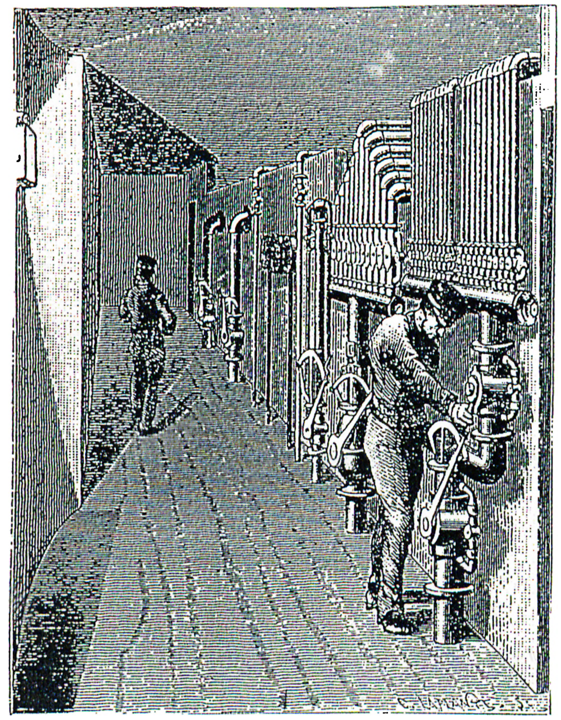


Figure 2.7

Colored light was achieved by placing tinted silk screens or tinted glass panels in front of burners (Right, 1958). By the help of mechanical devices, the color filters were changed remotely. However this application had a limited capacity for different colors (Barber, 1953).

Gas lighting had its disadvantages as well as its advantages. First of all, the fire risk was increased due to the failures at the fittings. The oxygen consumption was excessive, and unpleasant fumes and heat were creating a problem (Brockett, 1987). Philip Barber (1953) cites that " At the end of a three hour performance the oxygen in the auditorium and on the stage was almost exhausted, and attempts to provide ventilation involved dangerous drafts that increased the fire hazard". Although gas lighting had all the above disadvantages it was accepted extensively.

The developments in gas lighting and their adaptation to theater, made the stage lighting a dynamic medium. The meaning of stage lighting enhanced from general illumination of the stage, to specific illumination of different scenes. Limelight enabled to concentrate the attention of the audience in one point by a beam of light (Barber, 1953). Moreover realism increased by the proper usage of higher illumination level generated by limelights. This increase in illumination level also effected architecture: increase in visibility allowed to build larger theaters (Brocket, 1987).

Another important development was the invention of the arc light by Sir Humphry Davy in 1808. Due to the lack of satisfactory electric supplies it did not gain a great acceptance until 1840 for general illumination. It was first used In 1846 in Paris Opera to create the effect of a rising sun (Brockett, 1987).Arc light was used to imitate the sunlight or moonlight and it was also the main light source of the projection devices. The hood of early arc spots was made of teak that was lined by asbestos (fig. 2.8). There were shutters placed in between the lens and the carbon rods, used to dim the light. However one man had to control each carbon arc to dim and to adjust the clearances between two carbon rods. (Bentham, 1980).

Invention of the incandescent lamp by Thomas Edison in 1879 is a very important evolution in stage lighting. This invention marks the beginning of modern stage lighting. According to the Encyclopedia Britanica, Paris Opera was the first theater that introduced this new system. However, Bentham(1980) states that, it was first installed in the Savoy Theater in London in 1881. On the other hand Stevens (1953) says that " It was first installed in the U.S.A. and soon after in England (about 1881) ".

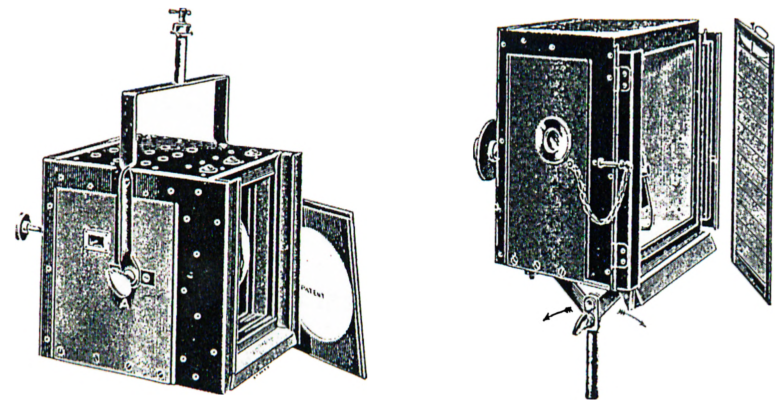


Figure 2.8

However, the application at the Savoy Theater in London was the most significant one, because it was the first theater that was completely lighted by electricity. The interesting aspect of this application was the usage of six dimmers to control the intensity of electric lamps (Bentham, 1980). Even though the illumination level of the electric lamps was not very much different from the gaslight sources, it was widely accepted, because electric lighting was much cooler than gas lighting that reduced the fire risk (Stevens, 1951).

Early forms of electric lighting elements were still having the conventions of gas lighting. The main reason was, the carbon filamented lamps were unable to give brighter light than gas lights. To be able to achieve a desired level of illuminance on the stage electric lanterns was used in a series battens of bare bulbs. These battens were also called "floats" or footlights. Later on by the additional reflector, efficiency of those battens increased and they supplied better illumination (Bentham, 1980).

Increase in the light intensity is achieved by the developments in bulb design and filament material. These technological developments affected the design of the lanterns. Earliest incandescent spotlights is developed by Louis Hartmann. It is equipped with a plano-convex lens and a spherical reflector (fig. 2.9). These lanterns were very big and bulky, due to the large size lamps that needed big lenses. However they became the first practical FOH lights and they were used instead of footlights. Application of fresnel lens improved the optical system, and fresnel spotlight (fig. 2.10) became an important element of stage lighting. Different reflectors and optical systems were also improved the light intensity and light control. Introduction of the ellipsoidal spotlight made the greatest change on the spotlights (fig. 2.11). Technological developments lead to powerful light source in a smaller hood that increased the flexibility of lighting (Nelson, 1975).

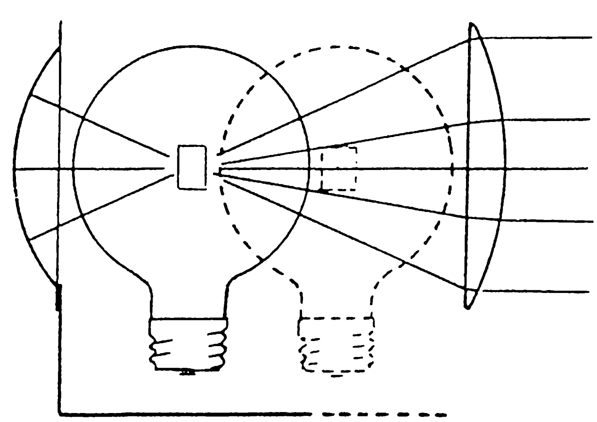


Figure 2.9

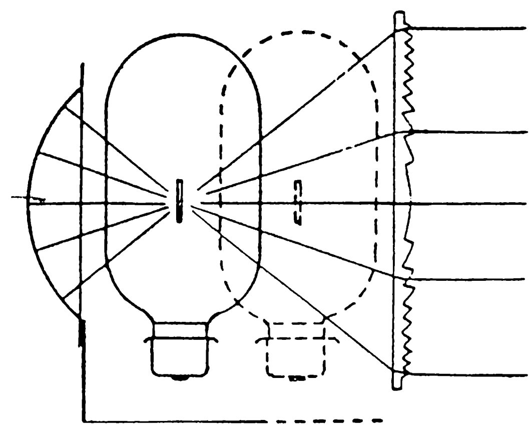


Figure 2.10

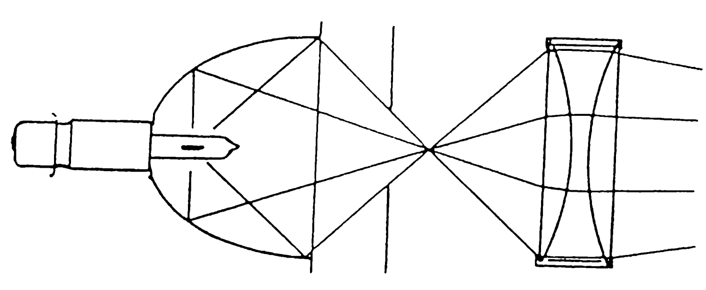


Figure 2.11

As stated above, since the beginning of the electric stage lighting, dimmers were used. The earliest dimmers were mechanically controlled using the principle of getting the electricity through a partially conducting liquid. It was possible to achieve very smooth dimming, but the maintenance was a problem (Wolf, 1987). However this early system was too big and all dimmer equipment had to be placed at the basement of the theater. They were controlled from the first floor by some wire, pulley, and lever system (Gillette, 1987).

Progressing technology lead to the development of new dimmers. After the liquid dimmers, saturable core dimmers took place. Later on auto transformers applied to the dimmers. But these dimmers were very big and the main dimming equipment was still had to be kept in the basement and the control equipment was still consisted of wire pulley system (Gillette, 1987). Developments on the dimmer technology in United States lead to a compact solution. Small resistance dimmers mounted at the back of the main control panel lead to very compact design comparing to its competitors. This system could be placed easily where ever it was desired (Bentham, 1980). Later on electromechanic means was abandoned and the developments in electronic technology enabled compact solutions such as silicon controlled rectifiers (SCR).

After the introduction of electric lighting, many different methods has been tried to color the light. Sir Henry Irving tried to paint the bulbs by transparent paints (Encyclopedia Britanica). Later on, Mariano Fortuny directed light sources towards colored silk panels (Brocket, 1983). In the early 1920's Adrian Samolioff also tried to paint the bulbs. Due to increased wattage, the paint burned and the color spoiled (Bentham, 1980). Since the end of seventeenth century colored glass filters were always in fashion. However, they were fragile and had a limited color range. The spectrum of colors increased by the invention of the sheet gelatin filters in late 1800's. These filters had about 75 different tints and they became very popular. Gelatin filters were easy to produce, cheap, and had good light transmission properties. Moreover, they were affected from moisture and heat (Eddy, 1990). Consequently filter technology has grown more rapidly in the last 40 years and the problem of high temperature has been solved by the application of sheet polyester and sheet polycarbonate as filtering elements (Eddy, 1990).

At the beginning of the century stage lighting was considered as floodlighting the stage. The lighting instruments were still placed as footlights in front, striplights at the top and borderlights at the sides of the proscenium as the days of gas lighting. Even in the late twenties and early thirties this did not change. (Bentham, 1980). But later on introduction of powerful spotlights wiped out the footlights and the conventions related to them. It became possible to illuminate the stage from each side of the proscenium arch, and also from the auditorium. The sense of volume of the stage increased by hanging the spots so that they can provide back lighting (Encyclopedia Britanica). The baroque concept of painting the decor with deep dyed paints changed as painting the decor with colored light (Brocket, 1987). Attempts to change painted scenery with projected effects has been studied in the beginning of the 20th century by D'yberry Fitsch. Afterwards, projected scenery became one of the most important features of stage and stage lighting design.

As it is stated above, developments in the technology always lead to the perfection of the equipment and the techniques. This does not mean that a new invention or innovation sweeped the older technology. The transition always took a long time and usually the old technology has used along with the new one. For example an old liquid dimmer is still functioning when the Aldwych theater was bought by Royal Shakespeare Theater in 1960 (Bentham, 1980). Every development in the field opened new horizons to the creativity of the designer.

3 FUNDAMENTALS OF STAGE LIGHTING

Theater is an environment that is a microcosm of life where the players are the visual representations of real people and the stage is the visual representation of the world. Actors and the scenery are the main elements of this dramatic environment. True manipulation of these elements brings up the message that is conveyed to the audience. Lighting plays a very important role in this action; it unifies the whole field of visual expressions. It is a changing medium that reinforces the action, sustains the mood, and focuses the attention of the audience. The analysis of the main components and functions of stage lighting will state the importance of the theme.

3.1 TYPES OF STAGE LIGHTING

According to the type of stage setting, there are two types of stage lighting methods: traditional stage lighting and modern stage lighting.

Traditional stage lighting is used for the pictorial stage-set (fig. 3.1) that is used since the medieval theater. The background is consisted of flat drops and wings, on which the architecture, furniture including the tables and chairs are painted with heavy shadows and exaggerated perspective. To clarify the image, the scenery is painted in very strong and brilliant colors, due to the low illumination level of the past (Nelson, 1975).

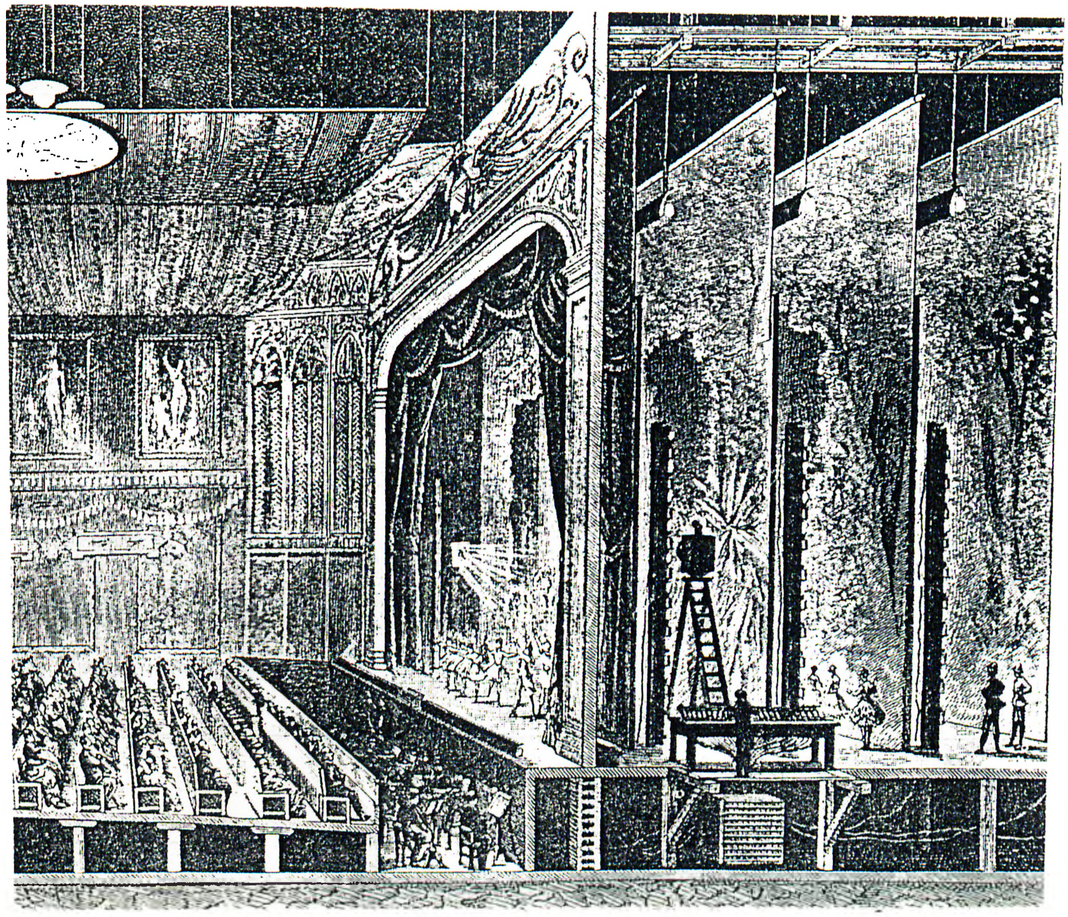


Figure 3.1

Lighting is difficult for this kind of stage that needs sufficient illumination for both the scenery and the performing actors; i.e., the setup should provide sufficient light both for two dimensional and three dimensional media. If the lighting design is set according to the flat scenery (strong front lighting), due to the loss of shadows the actors will sweep off the stage and become two dimensional. Consequently, this reduces the communication between the actor and the audience. During the recent times, to sustain the communication and to enhance the facial expressions, performers used to wear grotesquely heavy make up. To support the sense of three dimensionality, two different lighting types are used, one for the performers and one for the flat scenery. The flat scenery has to be accurately lit with soft and diffused light that should stop in between the wings. The performers have to be lighted by directional, and hard edged light, to create some shadows (Vanni, 1991).

The three dimensional lighting approach is developed by Adolphe Appia (1862 - 1928) who analyzed the problems and the failures of the traditional theatrical production. He came up with the revolutionary ideas that the stage presentation involves three conflicting visual elements: the moving three dimensional performer, two dimensional perpendicular scenery and horizontal floor. He figured that two dimensional scenery were creating a disunity, and changed it with three dimensional solid elements. Moreover he emphasized the role of light in combining all the visual elements as a unified whole (Brocket, 1987).

In this type of lighting, as there is not a back scenery, one creates the stage effect through lighting. It is possible to use stronger light sources when the stage is made of solid elements. Manipulation of light and shadow enhances the feeling of depth and space. This type is easier than traditional one, because there is only one type of light that is used for lighting. In decoration, pastel tones are preferred, because the designer paints the objects and the performers with colored light. In bold outline modern lighting can be described in terms of square consisting of a bright pattern of strong backlight, paths of strong cross light and the necessary light from the front (Vanni, 1991).

3.2 FUNCTIONS OF STAGE LIGHTING

Proper lighting increases the audience's understanding and appreciation of the play. It also extends beyond visibility to the achievement of the artistic composition, production of atmosphere effects, and the revelation of forms. These functions result from the true manipulation of the different qualities of light: distribution, intensity, movement, and color.

3.2.1 ILLUMINATION

Visibility is the basic function of stage lighting. In theatrical performances the communication between the actor and the audience is dependent on sound and sight. Apart from voice, the complete body and especially the face is the main communication means of a performer. To sustain a communication, performers must be visible (Reid, 1987). To achieve a good level of visibility there must be sufficient level of illumination on the stage. The term sufficient illumination refers to a comfortable level between excessive light and under lighting without a strain or glare.

One of the factor that effects the visibility is the place of the spectator. Unless the auditorium is very small, it is hard to provide the sufficient visibility for each person. If there is enough visibility for the front row, there will be insufficient for the back rows. If there will be enough light for the back rows, the scene will be overbright for the front rows. Another factor that is effecting the level of visibility is the eye adaptation to the changes to the intensity of light. Therefore the required light depends on the light intensity of the previous scenery. As an example, it is difficult to see a very intimate scenery after very strong house lights or it is tiring to look to a very bright scenery after an intimate one.

We cannot define visibility as a fixed degree of brightness or an established angle of distribution. Since the visibility is affected by the contrast, taking away the light source from the visual field ends with the greater focus and greater acuity (Fisher, 1974). In most performing shows the actors move, and the attention of the audience shift to differing parts of the stage. However, in cinema or television, it is easy to focus the attention by just zooming on the subject. In theater, lighting designer can force the audience by manipulating the human instinct of directing the attention to the brighter areas (fig. 3.2). That is called selective visibility.

Figure 3.2

3.2.2 REVELATION OF FORM

As stated before, in the traditional proscenium type theater there is a tendency for the scenery to be perceived in dimensions (height and width). The third dimension is present, but not perceptible. This effect is reinforced by the increased size of the auditoriums, which leads the scene look flat for the spectator seated further from the stage. This effect is one of the reasons to seek for alternative theater forms like theater with thrust stage or theater in the round (Reid, 1987).

Modern stage has a great potential to stress the three dimensionality. The director uses different techniques to reinforce the depth. The elements of the scenery can be placed in a manner to reinforce the three dimensionality or the director can place the performers in several levels that emphasizes the depth. Texture or color can also be used to emphasize the three dimensionally. However lighting designer can easily kill these attempts and make the scene look flat by pumping light from the horizon line (fig 3.3) (Reid, 1987).

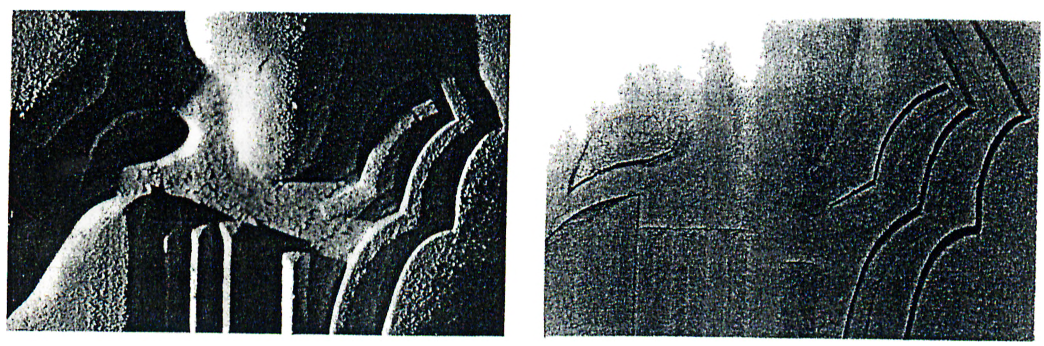


Figure 3.3

To reveal a form modeling is an essential factor used by the lighting designer (fig. 3.4). Modeling is a pattern of highlight and shadow that is reflected from the object to eye. To achieve this, different qualities of light are used. These qualities are direction, distribution, movement and color. Within those qualities, direction is the most important among others to sustain highlight and shadow.

True manipulation of each element of the pattern and the combination of different patterns enhances the depth perceived by the audience (Gillette, 1987). This combination should be created so that the actors must not be lost in the scenery. As a result the actors and the scenery must be properly lit with a three dimensional relationship to each other (Reid, 1987).

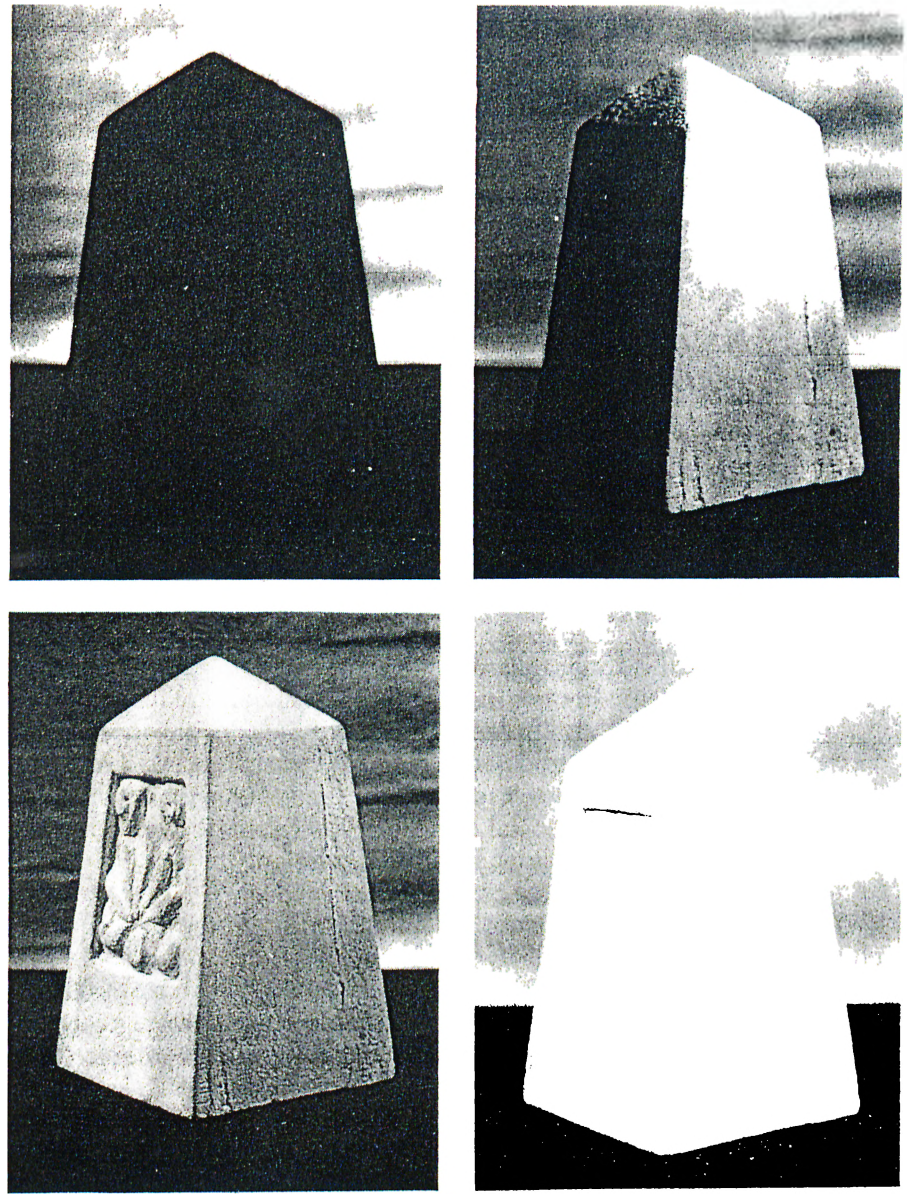


Figure 3.4

3.2.3 ATMOSPHERE

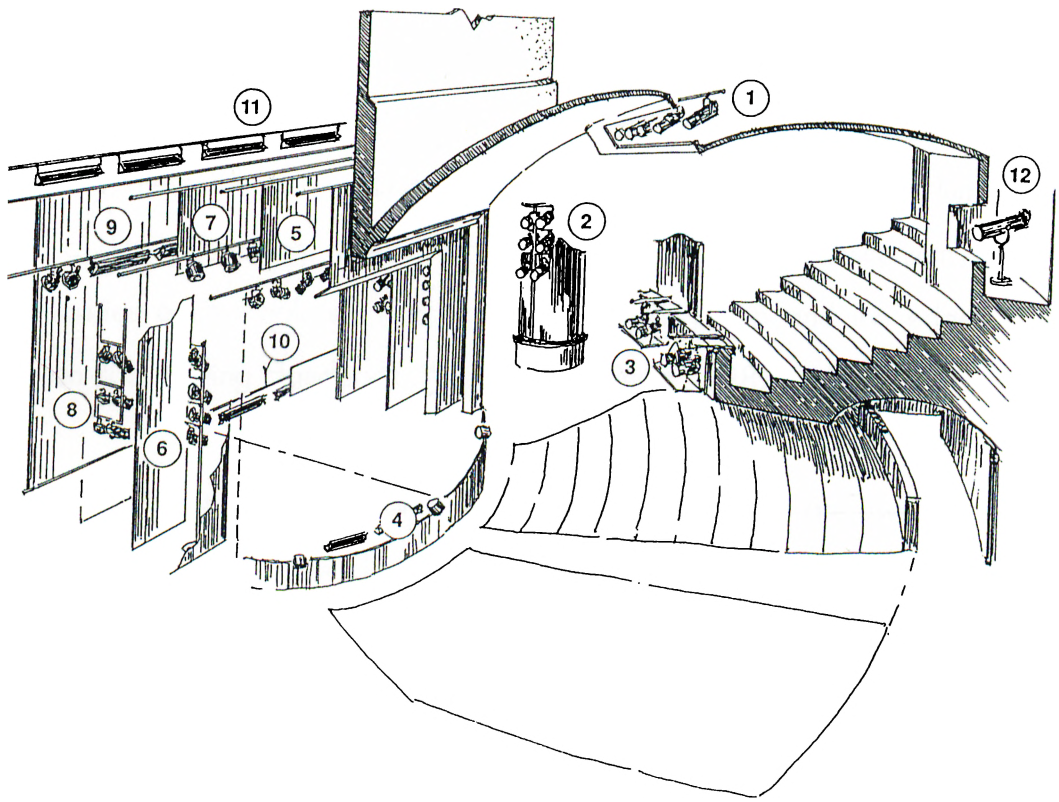
The most fascinating use of light is its ability to influence the mental state of the audience. The term atmosphere refers to a wide range of situations that can vary from the expression of time and space, to certain emotions that are conveyed to spectator (Reid, 1987).

The concept of time in theater can refer from the exact representation of a specific moment in a day, to the feeling of a season. In that manner nature provide a very good example that must be observed carefully. The observation of the behavior of the light in nature provides clues that should be carried to stage lighting (Encyclopedia Britanica).

Mood can be explained as creating the desired dramatic effect. In that manner light can help to control whether the audience should feel happy or sad, extrovert or withdrawn, aggressive or submissive. It is a very important function of stage lighting that must function in harmony with other functions. Consequently, lighting designer must be very careful while establishing a mood. As an example the outcome of that specific dramatic effect must not disregard the illumination function.

3.3 LIGHTING LOCATIONS

The real problematic part of stage lighting is where the lights are placed, what they are pointed at, and how the beams are adjusted. It is the placing and the pointing decisions that are the creative part of the realizing lighting concept. However those creative ideas are very much dependent upon the available lighting locations in the theater house. More or less the locations determine the flexibility of the designer in its creative process.
The proscenium theater offers many possibilities for varying the angle and the direction of a light source (fig. 3.5). Basically there are two groups of locations: locations in front of the proscenium and locations behind the proscenium. The three dimensional approach to lighting, developed within the confines of the proscenium stage; it is also valid for the thrust or arena stage.



1: Ceiling beams or ports, 2: Box booms or coves, 3: Balcony front or balcony rail, 4: Apron or footlights, 5: First electric or bridge, 6: Boom, 7: Second electric (mid stage backlight position), 8: Ladder, 9: Third electric (backdrop or cyclorama lighting), 10: Cyclorama base or horizon lights, 11: Translucent drop backlight, 12: Followspot.

Figure 3.5

3.3.1 LOCATIONS IN FRONT OF THE PROSCENIUM OPENING

As it is cited by Davis, 1975, first stage lighting theories are generated by Stanley McCandless who wrote "A Method of Lighting the Stage" in 1932. This book has became the fundamental text for the explanation of stage lighting functions, especially for the ones done in front of the house locations (Davis, 1975). There are five lighting locations in front of the proscenium: luminaries in the auditorium ceiling, luminaries in the auditorium and proscenium sidewalls, luminaries on the balcony front, the follow spot booth and the edge of stage apron (IES Lighting Handbook, Application Volume, 1987).

The luminaries that are positioned on the auditorium ceiling are used for the basic purposes of lighting the down stage area. McCandless' contribution was to theorize that the ideal placement of a light for any actor was along the diagonal of a cube with the actor's face at one corner and the light at the opposite corner (figure 3.6). According to his theory two lights are necessary for balance, one usually in a dominant, warm tone, the other in a cool shadow tone. This results with a face rendered by fill light on one side, and a key light on the on the opposite side. This slight difference in color and intensity increases the visibility and form revelation. Larger areas can be covered by increasing the number of cube patterns. The result is even light cover of the area (figure 3.7) (Davis, 1975).

However, McCandless' magic angle of 45°, is not the one and the only solution for the front of the house locations. Different angles and different locations are necessary according to the task. Higher angles are necessary for the sceneries with little depth (fig. 3.8). This technique is also used to keep the projections and light colored scenery in dark. Higher angles are also essential for realistic effects of strong sunlight or moonlight (Davis, 1975).

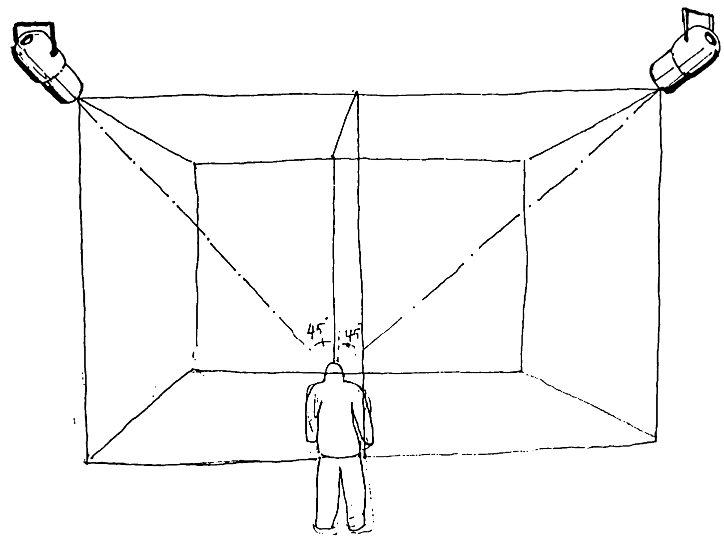


Figure 3.6

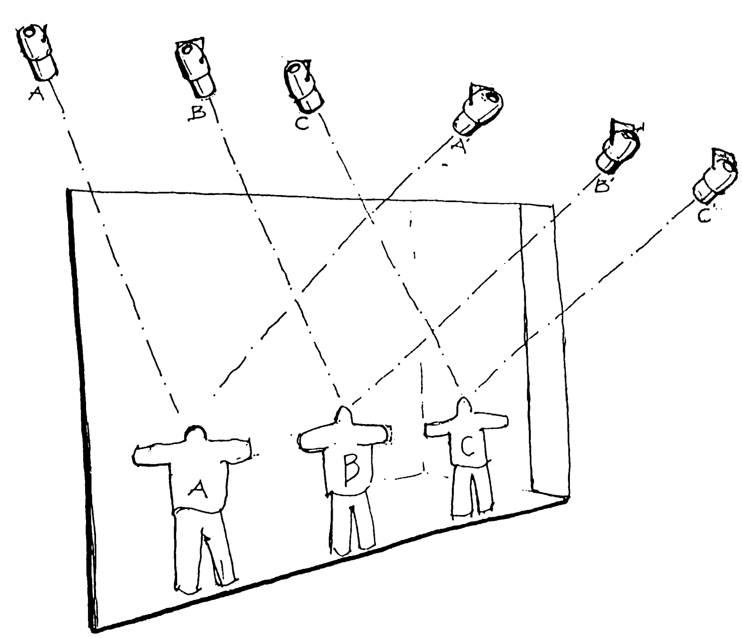


Figure 3.7

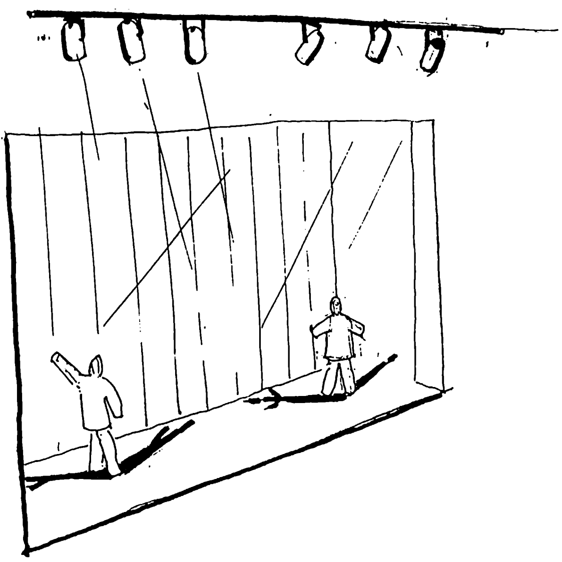


Figure 3.8

On the other hand, lower angles are used for comedy, where a shadowless light is necessary without the problem of illuminated scenery. Another possible usage of low angle is the need to get under some obstructions like ceiling, foliage, or any other scenic element that can cut off the light from every other position (fig. 3.9) (Davis, 1975).

Each luminaire that is placed on the auditorium ceiling should provide a clearly defined light beam pattern that can be adjusted to prevent light spill onto adjacent areas. Due their precise beam control, ellipsoidal reflectored spotlights equipped with shutters, are ideal luminaries for that purpose. These spotlights are best located in continuos slot stretching across the ceiling from one side wall to the other wall (IES Lighting Handbook, Application Volume, 1987).

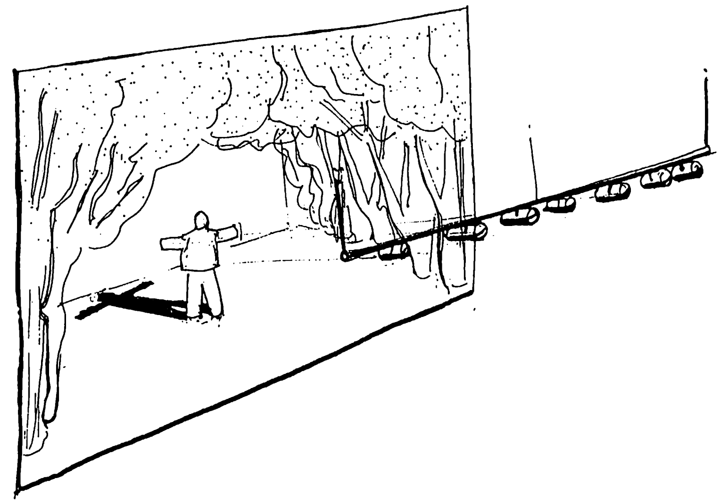


Figure 3.9

Box booms are vertical pipes located on the sidewalls of the auditorium (fig. 3.10). Luminaries located on the box booms are in use mainly as a supplement to the ceiling spotlights. They are essential locations to light the shallow stages without spilling on the scenery. These locations are widely used in Broadway since 1920's (Davis, 1975). The reason is the lack of front-lighting positions. Depending on the position and the number of the booms, they provide a great range of lighting angles with excellent opportunity of sidelighting. Each boom can carry up to sixteen lamps. Ellipsoidal spotlights are also preferred in these locations due to their precise of beam control.

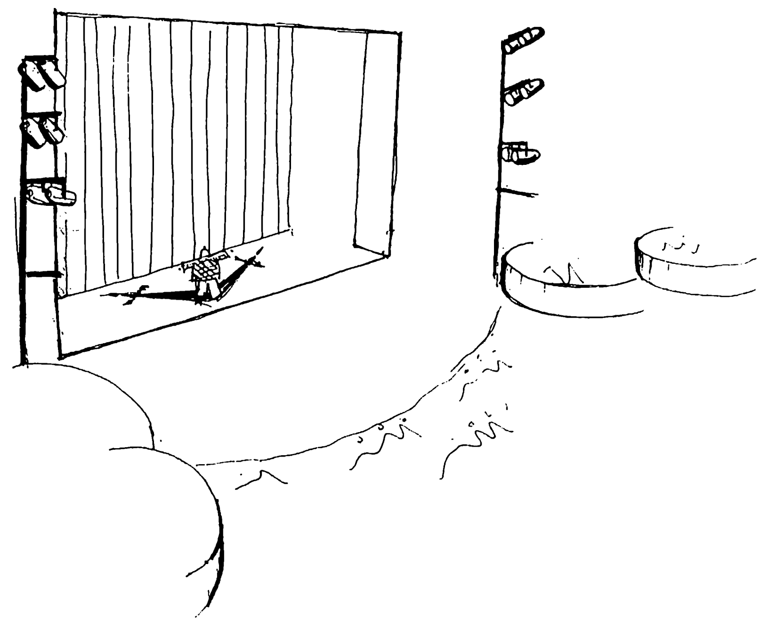


Figure 3.10

In most cases the lights on the auditorium ceiling and on box booms provide effective front lighting. However, in old theaters, ceiling locations are not always available. In this case most of the front lighting is supplied from balcony front and the box booms, but sufficient attention must be paid where shadows fall (Nuckolls, 1976).

However, in some cases the locations on the balcony front are necessary to provide low angled soft wash of fill light. Flashy, bright musicals need the extra power of balcony rail lights. In this case, as there is only a slight vertical angle, it tends to wash out neutral facial characteristics and cast shadows on the scenery (Davis, 1975).

Balcony front is an ideal location to place the projection devices or any essential device for multimedia performances (fig. 3.11). However, proper access to the instruments is necessary to focus or to change the projection media. Drops or any scenic elements in the first few meters are usually lit by the lights located on the balcony rail, but the beam must be shuttered carefully (fig. 3.12). At the beginning of the show, the stage curtain is illuminated by the spotlights (curtain warmers) in this location (Davis 1975).

Follow spots are used to highlight selected performers. They are strong lights equipped with beam adjusting accessories. Lights from these positions are useful to focus the attention of the audience. However, they create a strong shadow on the scenery (fig. 3.13). These positions are generally used on Broadway shows (Parker, 1990).

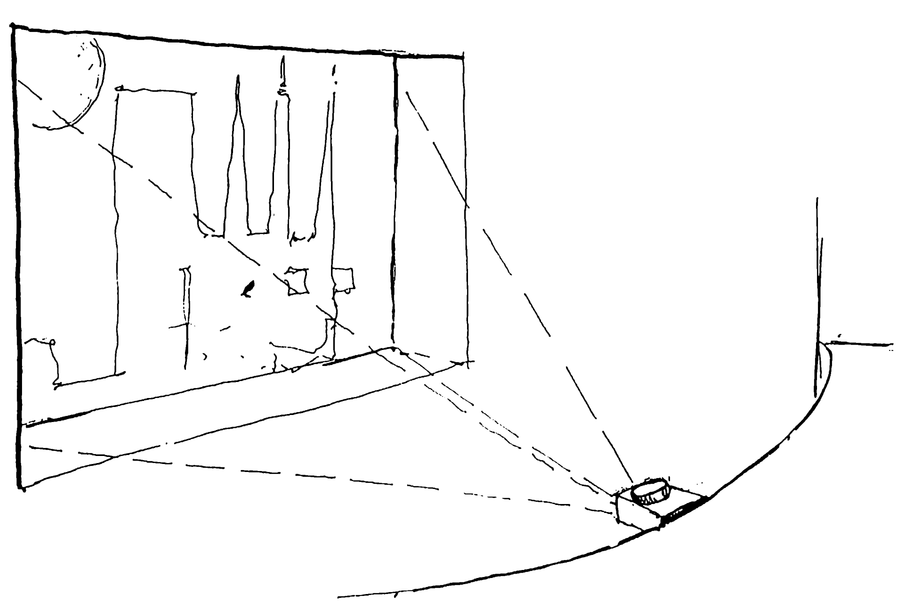


Figure 3.11

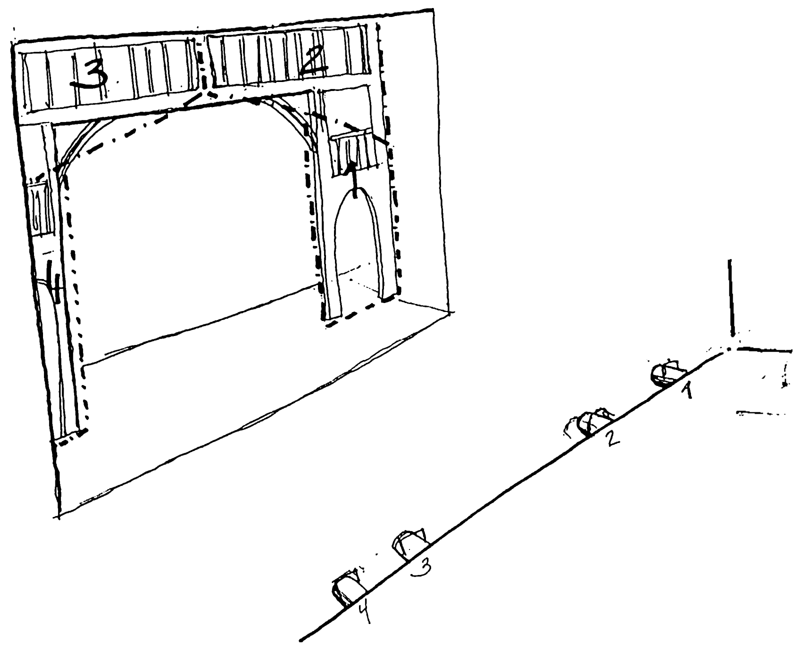


Figure 3.12

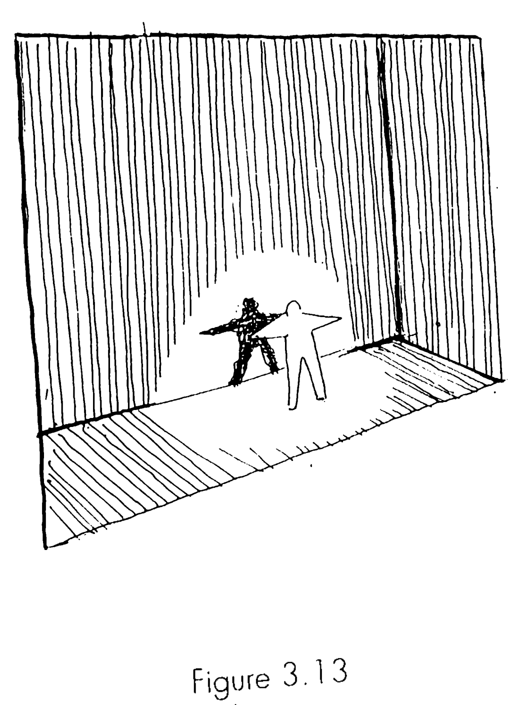


Figure 3.13

Lights in front of the stage apron are a set of colored striplights that are a carryover from gas lighting. They are successful in lighting the painted wing and border scenery, at the sacrifice of naturalism. Footlights are used to soften face shadow cast by overhead luminaries, but they create a big and heavy shadow on the back scenery (fig. 3.14).

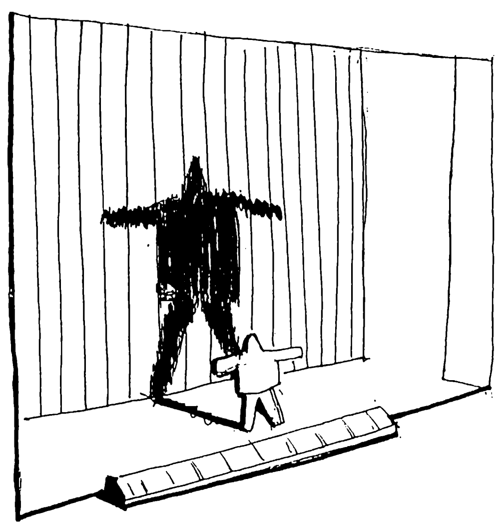


Figure 3.14

3.3.2 LOCATIONS BEHIND THE PROSCENIUM OPENING

There are two main locations behind the proscenium opening: overhead, and wing, locations. Each location has also its own sub-locations that produce different illumination qualities on the stage.

Overhead locations are consisted of parallel rows of luminaries that are suspended from the ceiling of the proscenium. The first row, embodies the greatest number of luminaries, carries a great number of fresnel spotlights and ellipsoidal spotlights. They contribute the tonal quality of the stage by providing sufficient diffused top lighting. These lights must be used carefully, because one can lose all the three dimensional representation (IES Lighting Handbook, Application Volume, 1987).

Locations at the second or third rows can be employed to define the actor by backlighting. Backlighting is a carryover from television to theater. It separates the actor from back scenery and adds an additional depth to the stage composition through creating a haze around the actor (fig. 3.15). By the help of backlighting the lighting designer can increase the illumination of the stage behind the actor. When it is properly done the actor is observed as he is etched from the background. It is desirable to use a narrow beam luminaire, but additional care must be employed to keep the light shining from the first rows of audience (Parker, 1990).

Cyclorama and any kind of drops lighted from overhead locations. Backings can be greater proportions, for example a section of exterior seen that might contain groundrows of distant hills or hedges and a section of sky. In these cases large vertical surfaces (backdrops) and cycloramas are used. The purpose is to create the illusion of speciousness, i.e., to enhance the visual limits of the stage. Such backings require greater attention for light distribution and color. Shadows generated by furniture or actors can create problem in backdrop lighting (fig. 3.16). The best solution is to change the direction of the luminaire that is creating the shadow, but is not always possible. Another solution is strong and diffused wallwash (Parker, 1990).

Cyclorama lights must be long enough to cover the whole visible backing. As the illuminance level must be at least double of the other borderlights, it is illuminated by rows of high wattage instruments. (IES Lighting Handbook, Application Volume, 1987).

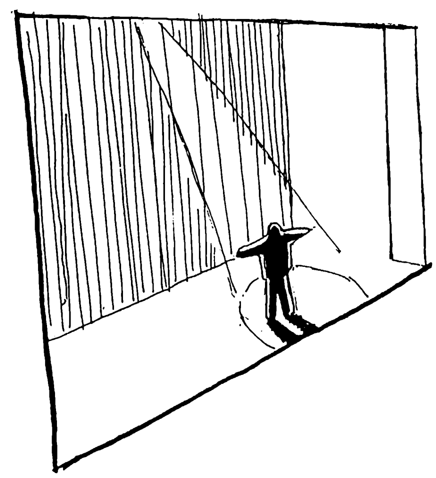


Figure 3.15

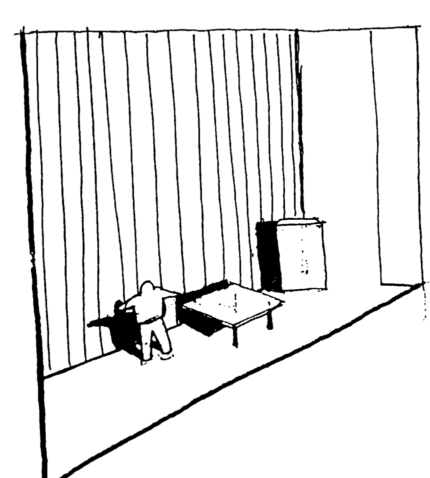


Figure 3.16

Sidelighting provides an additional flexibility when it is used with front lighting (fig. 3.17). There are two main sides lighting locations: on suspended three or four rung ladders or vertical side booms parallel to the apron with a variety of vertical angles. Lights from these positions provide increased modeling and visibility. They are used to add colored highlight to both scenery and actors. Another possible usage is to clear the unwanted shadows on the scenery. In addition, dramatic effects can be established by strong side lighting (Parker, 1990).

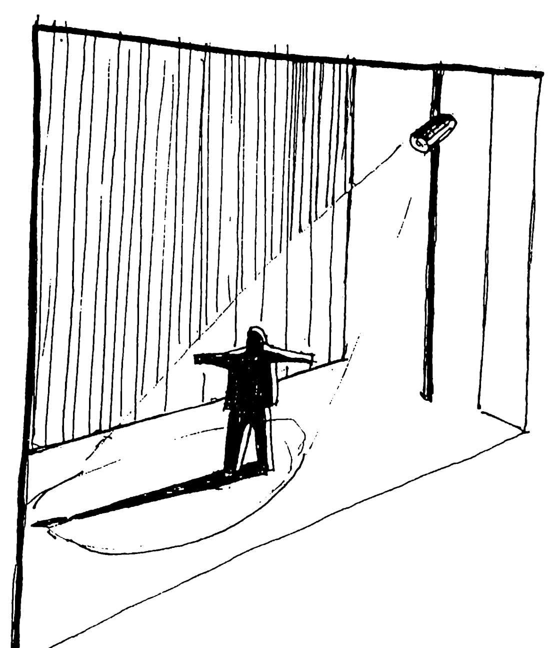


Figure 3.17

3.4 COLORED LIGHT IN STAGE LIGHTING

Stage lighting has a rich history of colored light application. Theater designers have long studied the issues of additive and subtractive color mixing, and the effects of colored light on scenery. However, among all the variables in stage lighting, color is probably the most difficult to control. There is no problem in coloring a single beam, but the difficulty arises in predicting the total additive effect of mixing several beams that are hitting a particular part of the stage from series of angles (Reid, 1987).

There are the two methods of mixing the color of light: additive color mixing and subtractive color mixing. While both methods affect hue changes, additive mixing also alters value, and subtractive mixing modifies chroma (Parker and Wolf, 1990).

When several individual hues are transmitted to the eye, added together, and interpreted by the brain, the process is called additive mixing. This can be seen in the medium of great impressionist painters, such as Monet and Suerat. A small patch of uniform tone is made up of many different colored tiny dots (Kruger, 1989). In the same manner white light is a mixture of all colors in the spectrum. The additive mixing of three primary hues produces secondary hues and synthetic white light (fig. 18). It is interesting to realize that the hues in figure 18 are not created on the projection surface, but they are the result of the stimulated retinal cones by different hues that the brain interprets as another hue. This phenomenon occurs when two or more hues are additively mixed to each other (Gillette, 1987).

The other way to achieve colored light is subtractive mixing. When light passes through any kind of filtering material, (i.e., glass, plastic) a certain portion of the spectrum is absorbed or reflected back. Colored filter functions in the same way, it allows only the wavelengths of light that correspond to its own color to pass (fig. 3.19). All other light is either absorbed and converted to heat, or reflected back. As a result, subtractive color mixing reduces the intensity of the output of the source (Gillette, 1987).

There are different reasons of using colored light on stage. Stage lights in their uncolored state, and close to full intensity, are relatively bright and harsh. They bleach any color out on the scenery, costumes, and makeup. To maintain the palettes of scenic and costume designers, compatible colored light is used. Another reason is to reinforce or change the mood of the scene; normally the scene is reinforced by light, but proper color selection will enhance this effect. Colored light is also used to increase the revelation of the form. Choice of two complementary colors striking to a three dimensional object (such as an actor's face) from different angles will gradually mix towards white by revealing the face (fig. 3.20) (Parker and Wolf, 1990).

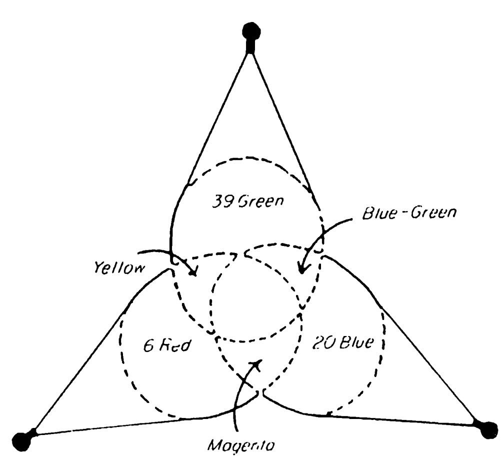


Figure 3.18

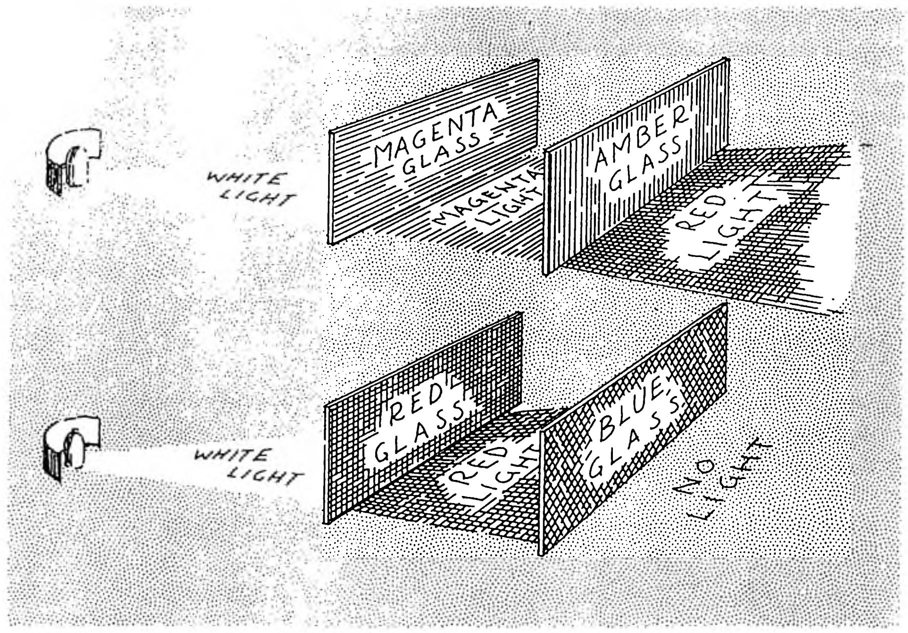


Figure 19

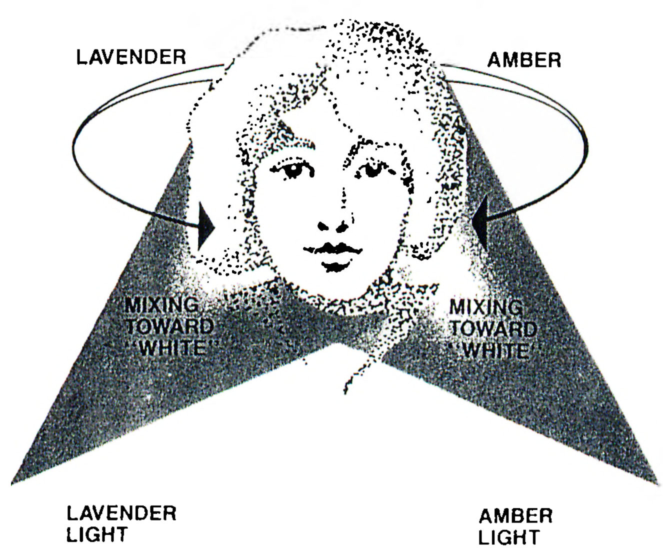


Figure 3.20

People react to color. This response is usually subtle and subconscious. There are many experiments done to about the psychological effects of color. It is found that there are demonstrable perceptual impressions of color applications that can affect the experiences of the people. In theater, there are some accepted color schemes that are the practical feedback of 500 years of theater history, Appendix (A) illustrate examples of these schemes.

As stated, mixing of complementary hues creates white light. However the discussion about additive color mixing, is thought with fully saturated hues. In theater, use of fully saturated hues are limited due to their adverse effects on costume designer's and scenic designer's palettes. To overcome this problem, complementary hues of low chroma are frequently used. The pigments enhanced by white light is produced by additive mixing of low chroma hues. These low saturation hues emphasize relatively narrow portion of the spectrum, although there is still a large portion of white light in the mix. The white surface reflects back those hues as well as white light to the eye. If those low saturated hues are complementary, brain interprets the mixture as white light. However the cones are more strongly stimulated by the complementary colors, than they would be with plain light, and the brain interprets this stronger color stimulation as a richer and more vibrant color mix (Gillette, 1987).

Although the understanding of laws of physics that govern the mixing of colors very helpful in using the color in theater, the real understanding of the nature and the application potentials of color can only be emphasized by experimentation.

4 EQUIPMENT USED FOR STAGE LIGHTING

After deciding about the lighting design, the next step is to select the equipment that is appropriate to the needs. The lighting designer must always go through a process of matching the known instrument capabilities with the specific requirements of the design. Mostly the available installations are not sufficient to realize some complex layouts. In this case, it is essential to know the physical characteristics of different equipment and how and when to use them to best advantage. In the proceeding sections of this chapter a brief information on the theater lighting equipment will be given.

4.1 LIGHT SOURCES

As stated in the second chapter, the invention of tungsten filament lamps opened a new era in stage lighting. Due to their ease of dimming and safety they became very popular. On the other hand incandescent lamp is one of the most inefficient tool to produce light. They convert around ten per cent of the energy, to light.

The perfect light source for stage lighting should be a point source in dimension. It should have the brightness of the sun and can be dimmed easily. Heat is also another problem. The unnecessary infrared portions of the energy spectrum causes overheating problems like bulb and filter burnout's. Consequently, a light source that emits little or no infrared portion of the energy spectrum is desirable. As it is very important to get the intended color, a properly balanced color rendering property is vital for an ideal light source (Watson, 1990). Today there are several attempts to achieve the factors that are listed above. Improvements in florescent lamp control, smaller filament design, and small sources like tungsten halogen, metallogen (hydrargyrum-medium iodides (HMI)) and other short arc sources are the technological developments made to achieve an ideal light source for the use in theater (Loeffler, 1989).

Generally there are four groups of lamps that are used in stage lighting. They are: tungsten incandescent lamps, quartz tungsten-halogen lamps, gas discharge lamps and arc lamps.

The first group is incandescent lamps that are in use since the recent times of electrical stage lighting. Those are the very big domestic lamps produced in higher wattage (Bentham, 1980). They have short life-cycles with decreasing light output. The reason is the evaporated tungsten deposit on the cooler glass envelope. Consequently, the bulb darkens and that causes a decrease in light output (Parker and Wolf, 1990). When they are full on, they produce light around 2800 K. Due to their size the fixtures that are designed for them are very big, and hard to control. However they lost their popularity, due to their size and inefficient light production comparing to new technology lamps.

The second group is quartz halogen lamps. In principle, quartz halogen lamps and the incandescence lamps are the same, they produce light by a glowing filament. The main difference is their inert gas; quartz halogen lamps are inerted with halogen or a chemically active gas to sustain the halogen cycle. Due to this halogen cycle, there would not be any carbon deposit inside the bulb and the filament is always replenished. As a result, the lamp gives constant light output throughout its life span that is longer than conventional incandescent lamps. As the reaction between the tungsten particles and the halogen gas requires very high temperatures, the glass envelope is made of quartz and small in size. Due to high operating temperature, tungsten halogen lamp produces light between 3050K to 3200K that is different from conventional incandescent lamps (Pollock, 1985).

The third group is gas discharge lamps. There are two types of gas discharge lamps used in stage lighting: low pressure gas-discharge lamps and high-pressure gas discharge lamps.

Fluorescent lamp is a low pressure gas discharge source. The inner walls of the tube are coated with fluorescent powders. Light is produced by fluorescent powders, activated by ultraviolet energy that is generated by a mercury arc. It is used in series with a current limiting device that is called ballast. Fluorescent lamps are cool and efficient light sources they reach to their maximum light output around 38 C°. It is possible to dim them by special dimmers along with special ballasts (IES Lighting Handbook, 1984). There are different white and colored fluorescent lamps with different spectral power distribution. Their color temperature varies from 2700K to 6500K.

Fluorescent lamps are not compact and they do not have wide usage in theater. They are only used for the scenes where a soft and even light wash is necessary for the cyclorama. However, almost all color can be obtained by three-color fluorescent cyclorama lighting system that produces the three primary colors, as well as white light, with its dimmer controls (Lemons, 1974). Eventhough the fluorescent lights have a limited usage in theater; they are widely used in television since 1940's (Hazirjian, 1993).

Metal Halide lamps are high intensity gas discharge lamps. Light is produced by an electric current that passes through vaporized mercury, argon and some metal halides. These lamps need a ballast to start and continue their operation. It is possible to dim Metal Halide lamps with a complex and expensive ballast. Generally they produce discontinuous light spectrum, but improved color balance can be produced by combining different elements that radiate in various regions of the spectrum (Loeffler, 1989). They are used to where a strong and directional light is needed. Metal Halide lamps are used to light such areas as stadiums and arenas, providing light levels and color quality suitable for televising performances. They also have the capabilities of providing "daylight fill" for movie and television productions.

The last group of lamps are arc lamps. They are the oldest family of light sources. There are two main groups of arc lamps: carbon arc and short arc lamps. Carbon arc was the first electric light sources. It is consisted of two carbon rods that are brought together to touch each other, and immediately separated by a short distance. A white hot spot is obtained on the positive electrode that is the source of light. Carbon arcs produce very bright and white light, but their carbon rods should be replaced very often (every hour). These lights can only be dimmed mechanically by the help of shutters or an iris that can be operated manually or remotely. Eventhough the light itself is small, the equipment needed to handle it, is very big and bulky (Bentham, 1980).

Short arc lamps combine the high efficacy of carbon arcs with easy maintenance and clean usage of conventional lamps. They are consisted of two electrodes that are placed inside a quartz envelope that is filled with xenon or xenon-mercury gas. These lamps are the closest light sources to point light source with high luminance. Their color temperature is around 6000K (IES Lighting Handbook, 1984). However, they can only be dimmed mechanically like carbon arcs. As an auxiliary, they need special and expensive ballast to start up. These light sources are used in follow spots and projection devices (Schelling, 1979).

There is also another type of lamp that is based on the combinations of short arc lamps and Metal Halide lamp technology that is called Compact Source Iodide (CSI) or hydrargyrum-medium iodides (HMI). This lamp is having the characteristics of both groups. The arc is operated between two tungsten electrodes that are placed into an ellipsoidal quartz envelope. It is filled with mercury, argon and some elements to complete the light spectrum. HMI lamp is a powerful point light source that can be dimmed electrically by a complex ballast or by a mechanical douser. Their color temperature is among 4300 K and 5600K (IES Lighting Handbook Application Volume, 1987). They are widely used in television and film industries, due to their low heat, and high efficacy output. These lamps are becoming popular in stage lighting (Lemons, 1978).

Some lamps include integrally all or a part of the optical system. These are the lamps made in standard and special bulb shapes that have a reflective coating, applied to a part of the bulb surface along. There are two types of reflectored lamps: R, and PAR. R type reflectored lamps have only a rough beam control. However, in PAR or sealed beam lamps, there is a lens or a break-up surface molded in front of the reflector. Besides the reflector and the optical device a fog cap shield is placed in front of the filament to direct the light towards the reflector first. By the help of these optical elements precise beam control is obtained. This kind of lamps is widely used in display, automotive, aircraft, and architectural lighting. However, in a sealed beam lamp the optical system is designed for only one purpose that puts out its efficiency on one single beam distribution (Bentham, 1980).

4.2 FILTERS

Since the beginning of stage lighting, all designers were aware of the importance of colored light. As stated in the second chapter, early lighting designers developed many different techniques to accomplish it. However, filtering by transparent colored sheets became the most popular and versatile one. The reason was wide color range and good light transmission properties (Eddy, 1990).

A filter system should have clean, wide and durable color range. The colors should not fade away or spoil due to high temperatures. It must not be scratched or cracked easily and it must resist to different climatic conditions. As it is going to be used extensively, it must also be cheap (Ruling, 1990). Today there are different types of coloring media with different technologies. They are: gel filters, dichroic filters, new technology glass filters and newly developed electronic color blending machines.

The most extensively used filters are gel filters. Eventhough the filters are not produced out of gelatin anymore; it is a generic term used to recall all plastic based filters. Today filters are made of three different plastic base materials by three different coloring techniques. The base materials are: acetate, polyester and polycarbonate. Three coloring techniques are surface coating, deep dying and body coating. It is impossible to say that one production method is superior than other. Each method has its advantages as well as disadvantage. The table below illustrates the superiority of those techniques to each other (Ruling, 1990).

Second group of color media is dichroic filters. They are based on the thin-film coating technology that are used in the camera lenses. The principle is to transmit the desired wavelength and reflect back the unnecessary ones. Due to this property they do not heat like conventional filters. Consequently there will not be any color spoiling problems related to overheating. However, only a few unsaturated colors are currently manufactured (Eddy, 1990).

	Color Fading	Crack Resistance	Price
Surface Coating	Poor	Poor	Cheap
Deep Dying	Good	Good	Medium
Body Coloring	Good	Excellent	Expensive

The latest technology in color media is electronic color blending. This new instrument is based on a new liquid crystal display technology. Previously transparent liquid crystals were used as diffuser and fader in follow spots. The system uses a proprietary patterned liquid crystal cell that has either dichroic or polyester color, coupled with RGB color blending circuit, that enables the device to independently control and vary the transmission of colors. As everything is held by electronics it is very fast and silent. However, it does not produce saturated colors and it is expensive (Eddy, 1990).

4.3 LANTERN TYPES

After the introduction of the incandescent lamp, a variety of lighting instruments was designed with different optical systems. All these luminaries provide different light characteristics. There are three main groups of theatrical lighting units. They are: striplights, floodlights, and spotlights.

4.3.1 STRIPLIGHTS

Striplights are the oldest type of stage luminaries. They are consisted of, a line of light sources that are placed inside a conduit. It produces the effect of line of light by a series of flood and medium flood lamps (R and PAR type). It produces smooth wash of light (fig. 4.1). The individual lamps within the instrument are wired in parallel to form three or four circuits. This type of configuration provides designers the opportunity to mix and blend color if each circuit is colored with different color (Gillette, 1987).

In early theaters, striplights were used to provide visibility on the stage. Today, they are used to color, tone and smooth out the areas that are illuminated by spotlights. They are used anywhere, where a wash of smooth light is desired (Wolf, 1987).

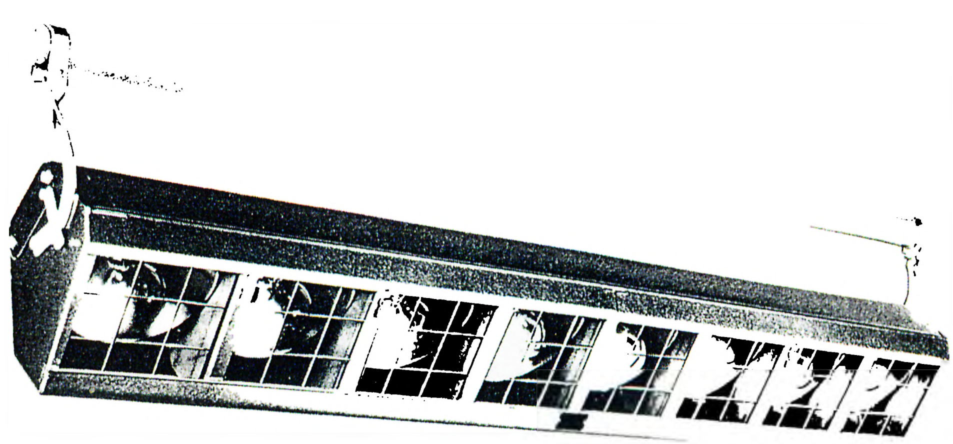


Figure 4.1

4.3.2 FLOOD LIGHTS

Flood lights are the simplest type of luminaries used in stage lighting. They are consisted of one bulb and one reflector that provides smooth and diffused wash of light. They are usually used to light the cycloramas and background drops, but they are also used for base or fill light in television. According to their reflector design and the lamp there are different types of flood lights.

Cyc light is a relatively new type of luminaire that has eccentric reflector with linear halogen lamp (fig 4.2). They can be used individually as well as strip form. Due to their reflector design they are more efficient at downward positions. It is used where a smooth wash of light is needed (Gillette, 1987).

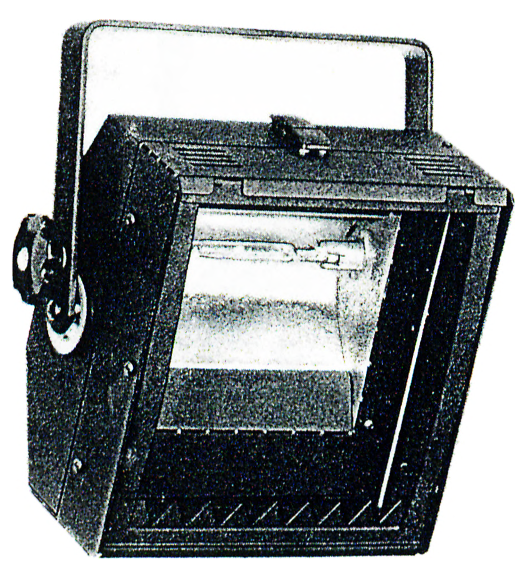


Figure 4.2

Another type of flood light is ellipsoidal reflector floodlight that is also called scoop flood (fig. 4.3). It is equipped with an ellipsoidal reflector with has matte or brushed metal finish. The reflector finish determines the shadow sharpness. Lamp and the reflector can be fixed or variable focus. It provides wide, smooth wash of light in variable angles, (IES, Lighting Handbook 1987 Application Volume, 1987)

Beam Projector is maybe the oldest type of floodlight. It is also known as Sun Spot or Parabolic Spotlight (fig. 4.4). It has a specular parabolic reflector and a point source. It is equipped with a spherical reflector or a spill ring in front of the light source, to minimize the spill light and glare. The reflector and the lamp are usually adjustable to change the beam angle. Unlike other floods this device provides a hard edged strong beam of light. It is used to create some shafts of light to imitate sunlight or moonlight on the stage. Beam projector is a perfect instrument for long throw distances (Wolf, 1987).

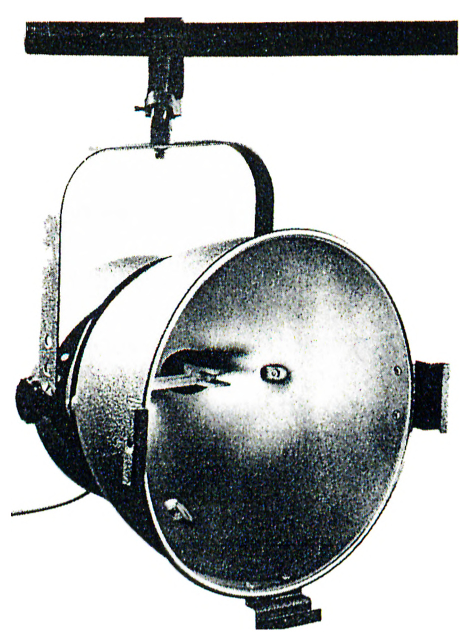


Figure 4.3

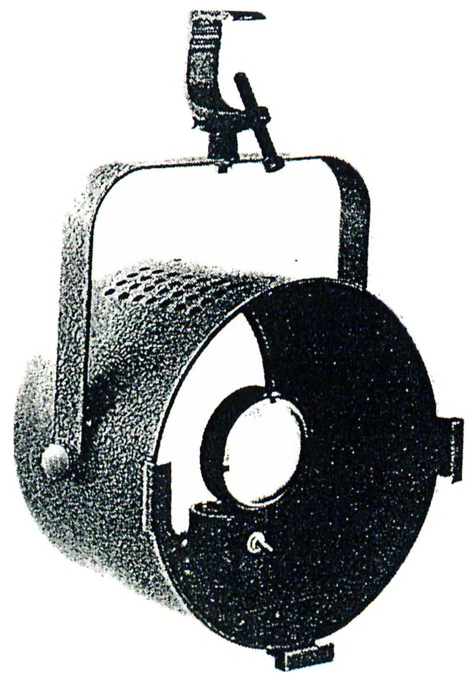


Figure 4.4

4.3.3 SPOTLIGHTS

Spotlights are the most important lighting equipment in stage lighting. They are consisted of a high powered light source, a lens and reflector system. The resulting beam can be shaped by various means. There are three main spotlight types: fresnel spotlight, ellipsoidal reflectored spotlight and the followspot. Besides them HMI based TV luminaries and remote controlled concert lights started to become popular in theater applications (Ruling, 1990).

Fresnel spotlight is one of the oldest and simplest spotlight design that is on use today (Fig 4.5). The fresnel spotlights are simple devices, the housing holds a fresnel lens in front, and a spherical reflector in the back, in between there is the sliding lamp socket platform. Focusing is done by changing the lamp to lens distance (IES, Lighting Handbook Application Volume, 1987). It produces extremely soft, even wash of light that is often applied in general illumination of acting areas. The light wraps around a figure, and the shadows will be soft edge and not very harsh. When it is focused on narrow beam, it produces a beam with a central hot spot that looses the intensity towards the edges. When it is focused on wide beam it produces soft and diffused light wash (Gillette, 1987). Beam shaping is done by barn doors, and funnel that can be placed in color frame holder. Any kind of color filter can be placed in front to color the light (Parker, 1990).

The ellipsoidal spotlight (fig. 4.6), that is also called as profile spot or pattern projector, operates with the basic principle of gathering the light from one focal point of an ellipse and focusing it to the second focal point. The light is produced from a fixed lamp and ellipsoidal reflector unit. It goes through a shaper that is either in the form of push shutters, an iris, or a template. The shaped beam then focused by an adjustable plano-convex or stepped lens system. When an ellipsoidal spotlight is equipped with double plano-convex train, it is possible to achieve a variable focal length. This instrument is called as zoom ellipse.

The output of the ellipsoidal spotlight is a narrow beam with hard edges. By focusing the lens system the edges of the beam can be softened. They are used to cover acting areas from all locations.

As it is stated above, there are different beam shaping devices. Template is a large group that is newly introduced to the market. When ellipsoidal reflectored spotlight is equipped with templates it can also be used as a pattern projector. There are many different pattern designs available on the market. Figure 4.7

illustrates a range of patterns that are available under one brand. Templates or patterns are also called as gobos (Heller, 1990).

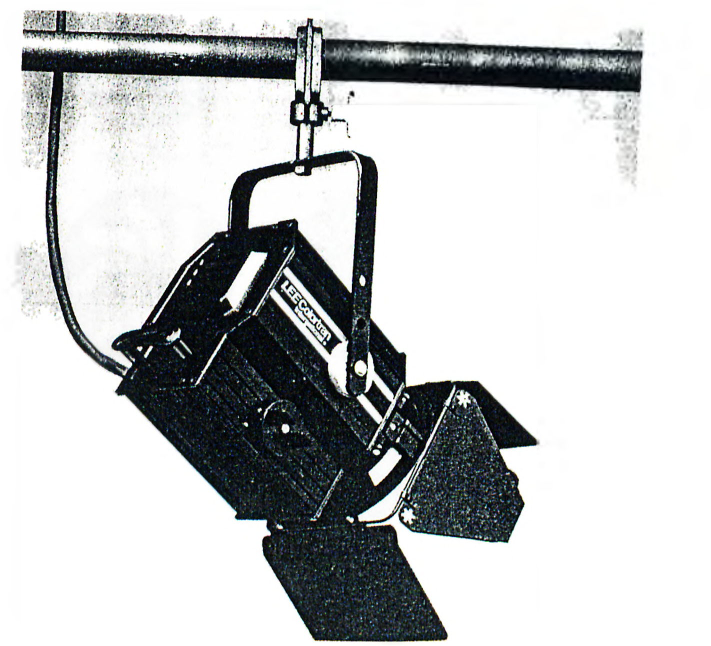
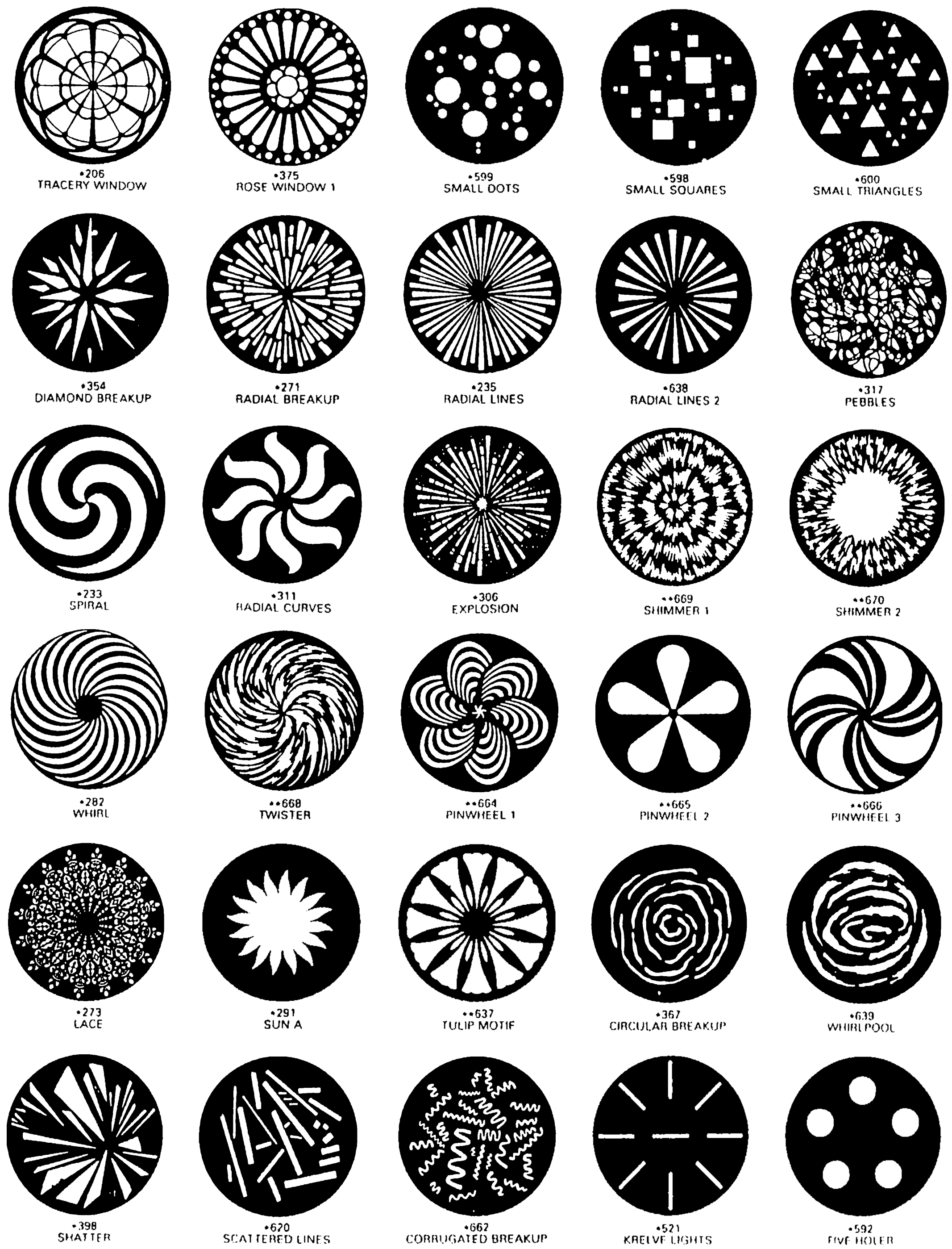


Figure 4.5

Figure 4.6



•206
TRACERY WINDOW
•375
ROSE WINDOW 1
•599
SMALL DOTS
•598
SMALL SQUARES
•600
SMALL TRIANGLES
•354
DIAMOND BREAKUP
•271
RADIAL BREAKUP
•235
RADIAL LINES
•638
RADIAL LINES 2
•317
PEBBLES
•233
SPIRAL
•311
RADIAL CURVES
•306
EXPLOSION
••669
SHIMMER 1
••670
SHIMMER 2
•282
WHIRL
••668
TWISTER
••664
PINWHEEL 1
••665
PINWHEEL 2
••666
PINWHEEL 3
•273
LACE
•291
SUN A
••637
TULIP MOTIF
•367
CIRCULAR BREAKUP
•639
WHIRLPOOL
•398
SHATTER
•620
SCATTERED LINES
•662
CORRUGATED BREAKUP
•521
KRELVE LIGHTS
•592
FIVE HOLER

Figure 4.7

Par Can is a relatively new luminaire used in stage lighting. They became popular after the application of the aircraft landing lights (ACL) to the stage lighting. Due to their strong output and easy maintenance they became workhorses for rock concerts. It is a cylindrical extruded metallic shell that embodies a PAR lamp and its socket (fig 4.8). Normally it does not contain an optical system, and the performance of the luminaire depends on the lamp it uses. It produces strong, soft edged and round beam (IES Lighting Handbook, 1987).

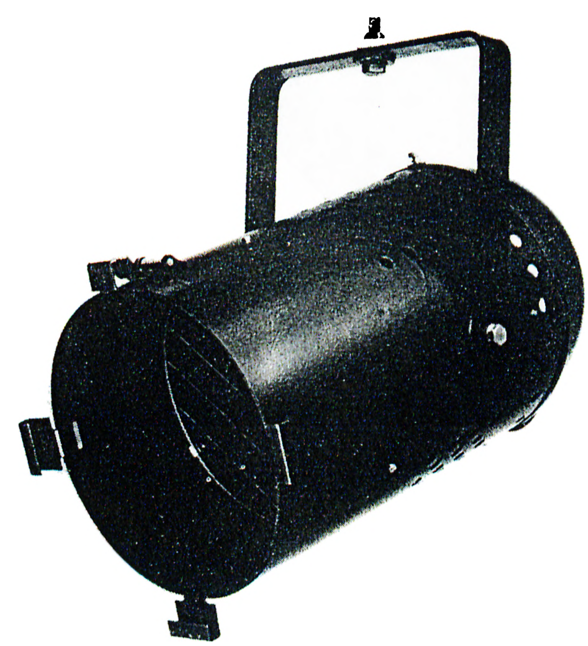


Figure 4.8

The follow spot (fig. 4.9) is an essential tool used to focus the attention of the audience at one point. It is always trained by an operator. The output is a powerful narrow beam with hard edges. Beam shaping is done with shutters and an iris; by manipulating them simultaneously the hard beam edge can be softened to degree. In small models incandescent or halogen lamps are used, but bigger follow spots are equipped with HMI lump or a carbon arc to achieve a powerful beam with a long throw distance (Hatch, 1975).

Figure 4.9

4.4 LIGHT CONTROL DEVICES

Light control devices are used to control and execute the cue sequence that is determined by the lighting designer. Silicon controlled rectifiers (SCR) are the heart of a modern control console. SCR is a solid state power transistor that does not contain any moving parts or big tubes. It is efficient, reliable, compact and cheap. Due those properties it is recognized as the best power handling device for a dimmer that is the heart of a lighting controller.

There are two main types of light consoles: manual consoles and computer assisted consoles. Manual consoles are still being produced. Familiarity, simplicity, reliability and the price are the reasons often cited by those who buy manual systems. Due to those reasons they survived the digital technology of the 80s and 90s (Hansen, 1990). Another type of board is the computer assisted memory or pure memory control consoles. The computer assisted controllers offer considerable flexibility, in programming and executing cues. In this type of console a computer stores the intensity levels of all dimmers for each cue. Computer memory replaces all the preset switches and eliminates the human error factor in the setting of intensity changes during the show. These consoles offer considerable flexibility in programming and executing cues. Any kind of computer input and output device can be used as peripherals. Almost all computer board except very low priced ones have one or two monitors to display the information about various functions. These additional elements can vary from touch sensible displays to infrared remote control units.

Movement was defined as a quality of light more than 50 years ago by Stanley McCandells. What he meant, was not the movement of the luminaries, but some subtle changes in the intensity of light. This definition of movement was a contemporary approach to the concept of stage lighting and kept its popularity for a long time. By the application of the computer technology to stage lighting luminaries, the concept of movement of light is changing. The equipment is going under revolutionary change. The attachment to the booms remained as the only fixed part of the luminaries. Today one can remotely control the pan, tilt, zoom, iris, color and pattern functions. To control these functions progressively, the capabilities of control consoles are enhanced (Pollock, 1986).

5 INFLUENCE OF STAGE LIGHTING DESIGN ON ARCHITECTURAL LIGHTING DESIGN

Light is always been special. Cavemen found that if they rubbed two sticks together they could produce a spark of light. Some of them thought that sun was divine, so they started to worship it. Centuries later, master builders learned how to develop structures that were only revealed by daylight. Greek temples were oriented so that the rising sun could light up the statue of the goddess or the god. During the gothic period, light undertook a very important role. The cathedrals built where light is used to honor God. As the architecture grew, the master builders reasoned as what was lighted stood out and what was left in shadow was not seen. The fascinating relationships between light and building made the principles of architecture that has been carried over from the past to present (O'Mahony, 1985). Le Corbusier (1970) stated that "Architecture is the masterly correct, and magnificent play of masses brought together in light".

Natural lighting has conditioned human existence and it is connected to the meaning of time, color and emotion. People identified the sun's course as time and it became an objective element of the reference for environment. Artificial electric lighting has introduced substantial variants in social evolution with the utilization of time, chromatic and emotional perception. New urban and domestic scenarios are experienced by artificial light (Pagiani, 1989). Recently the importance of lighting has been understood by the scientists and experiments are done to analyze the effects of artificial light among the users.

Today it is obvious that proper lighting design plays an important part in humanizing places of work. This leads to fewer mistakes, higher productivity and efficiency. In recent years, researches have "found" that patterns of light can be "communicative" in the sense that they suggest or reinforce ideas shared by the occupants having the same cultural or social background. The use of color, directional lighting, simulated daylight, and so on – provide culturally conditioned behavior and affective clues in guiding the user in environment. This indicates that it is possible to generate meaningful spatial information to alter the user's impression of meaning and importance (Flynn, 1988). Lighting patterns can also assist the designer in implementing impressions such as "soberness", "playfulness", "pleasantness", and "tension". Baron and Rea (1991) cite to Flynn (1977) that "Without downgrading the obvious influence of light fascinating visibility (and thus performance) of visual task, it seems equally obvious that light contributes in other ways to the visual quality of the room and to the sense of well being felt by the users of that room". However theater lighting designers are taking benefit of these facts for centuries.

5.1 SIMILARITIES AND DISTINCTIONS BETWEEN STAGE LIGHTING AND ARCHITECTURAL LIGHTING

As it is stated in the second chapter, the effect of controlled electric illuminations were first studied and applied in theaters. Stage has always functioned as a reflection of the world. Through this reflection, theater has been a laboratory to search and to create the lighting ideas that are waiting to be carried over architecture.

In theater, script is the basic source for the designer to catch ideas. Designer tries to enhance and dramatize the author's message that is hidden in between the lines. In architecture, there is no script to be inspired, however there are forms, finishes, texture, volume, and bunch of functional dynamics that are described by the architect in drawings and defined by the occupant in usage. There is an existing three dimensional script that is full of nuance and subtlety as a well-crafted stage script. The creative use of angle and color in light can enhance both the scenery on stage and a towering form in a city skyline with identical effect (Kruger, 1989).

In theater the lighting designer tries to reveal the actor, his relation to the other actors and his surroundings. In architecture giving the occupant the same role will involve the designer with the occupant, his interrelationships with other people, and his interactions with the space. These interactions can be any task that he is involving in. Supremacy of the person is the overriding contribution of the theater lighting design to architectural lighting design (Brandston, 1974).

As stated in the previous chapters there are three main objectives to be fulfilled in theater: illumination, revelation of form and mood. These are the objectives that can also establish the basics of architectural lighting.

The meaning of illumination in architectural lighting primarily mean to achieve visibility without strain or glare as it is in theater. The most important purpose of lighting is to enable people to see, what they need to see to perform various tasks. As stated above, additional to visibility, lighting patterns can also be used to provide some spatial cues. As it is in theatrical lighting the designer can affect and direct the user's attention by different patterns of light. For example accent lighting or high-contrast focal lighting (fig. 5.1) affect user attention as it is in a spotlighted scene in theater (Flynn, 1988).

In architecture the meaning of revelation of form refers to the perceived visual distinctiveness of architectural and human features in detail. By the help of main elements of light, three dimensional definitions of architectural elements, and human figures can be enhanced as it is in theater. As an example, one can easily reveal all the articulation of solids and voids in a space just using lighting the objects correctly (fig. 5.2).

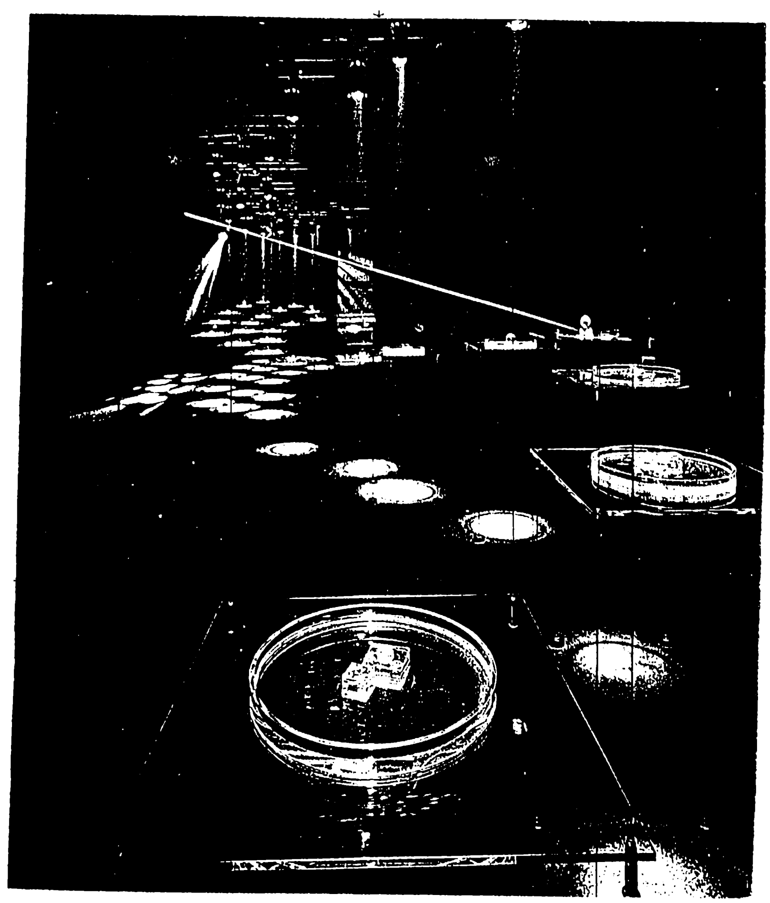


Figure 5.1

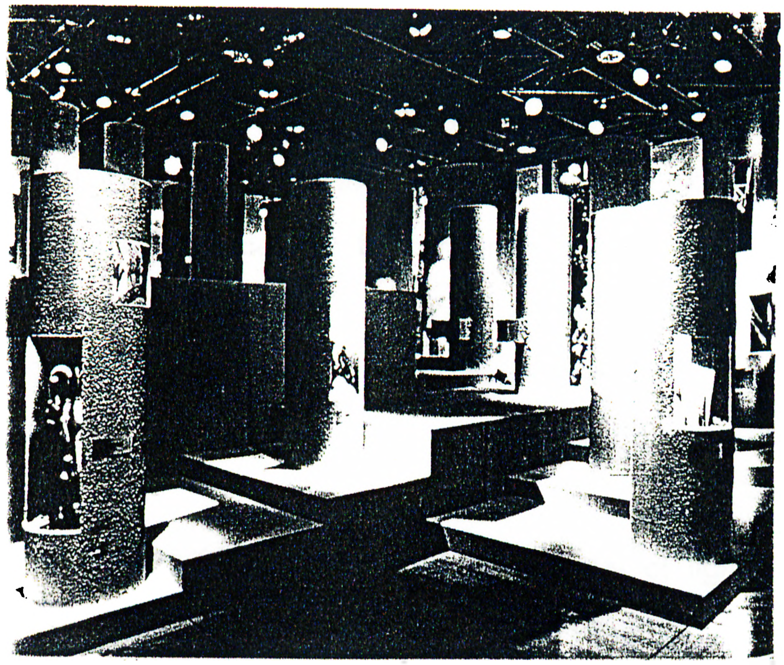


Figure 5.2

Good theatrical lighting design provides a visually exciting series of scenic illumination that creates the desired dramatic effect. In architecture, mood can be equated by the luminous environment. Good architectural lighting design provides a planned sequence of luminous environments that relate to people and space (Brandston, 1974). In this sense lighting patterns can assist the designer creating impressions of soberness, playfulness, pleasantness, etc. The architectural lighting designer uses lighting patterns to affect psychological impressions that affect the occupant's behavior, performance, and productivity. Analyzing the mood, light relation in theater helps the lighting designer to catch the ideas to achieve the desired atmosphere in the space (Flynn, 1988).

Lighting for the stage has a rich history of usage of colors. The phenomenon of additive mixing, and its effect on scenery has been analyzed by the stage lighting designers for a long time. It became one of the main element of the designer to achieve dramatic effects. Colored light can also be a major contributor in the dramatic lighting of exterior architectural forms as well as in their interior spaces (Kruger, 1989). By the usage of theatrical knowledge of colored light, architectural lighting designer can build a scene through the interaction of color control. Various light sources can be combined to create colorful effects on the surface of a building as well as its interior. However the usage of color must be handled very carefully, due to the color of the materials that are illuminated (Thomas, 1987).

As stated before, movement was described as a quality of light by Stanley McCandless more than 50 years ago (Davis, 1975). What he meant was the subtle changes in the intensity of lighting, employed to bring a dynamic element to the still-life stage compositions (Pollock, 1986). Today controlled movement of the luminaries and their effect on the scenery is added to this definition. There are several light control techniques, applied from theater to architecture that enables the usage of full spectrum of movement of light. This range varies from bumb cues in musical production to extremely long fades, or shifts of lighting value from one area to another for subtle reinforcement of directional blocking and audience focus. In architectural lighting, animated light was recently applied both to interiors and exteriors. As an example, retailers have discovered that the consumer attention can be altered to their benefit by varying lighting in the shopping mall, atrium or individual shop (Morris, 1989). On the other hand, such an animation can enhance the effectiveness of artificial lighting due to our subconscious conditioning to sunlight.

As stated above, there are many crossing points between the theatrical lighting and architectural lighting. However there are also some differences as well as similarities. One of the main difference is that the theater is very specific in terms of mood and timeliness. In a theatrical production the lighting designer supposed to achieve a moment of a specific time in the history. However in architectural lighting the design must be able succeed in the present and in the future. It should also accommodate different people and situations (Hooker, 1983).

From the technical point of view the distinctions are more clear. In theater, the designer can hide the equipment. The lighting can go into any number of different positions and one can achieve a successful theatrical layout that in an architectural installation would be chaotic. In architecture, the lighting equipment must be integral to the form and decor of the space. Other important distinction is that in theater the lighting instruments are temporary, but the life span of architectural lighting elements are almost as long as the life span of the building. In architectural lighting, there are also other facts that the designer must keep in mind. They are: maintenance, lamp life, cost, safety, coordination among heating and air condition, and lighting systems, and the requirements for energy conservation. These are all strange words for theatrical lightning designer (Hooker, 1983).

It is impossible to separate the architecture from light. It is obvious that the excellence in architecture does not come about only good lighting. However poor lighting can kill all the worthy in three dimensional forms. Light can be a tool for expression; it can explain the ideas and emotions. It can unify and tie together the whole field of visual expression that is encompassed in architectural forms. It has been so in the theater, in the illumination of the drama, of its players and their stage environment.

5.2 STAGE LIGHTING TECHNIQUES IN ARCHITECTURAL LIGHTING

The usage of ideas from theater to architectural lighting has been an ongoing and expanding process. Besides development of hardware, the basic techniques of putting the light where you want it and taking it away when you do not want it, were born in the theater. The techniques that are explained in third chapter were developed to fulfill specific visual needs and they are supplementary to each other. The techniques that proved their effectiveness are lately made the basis of architectural lighting.

As stated in the second chapter, footlights are the oldest lighting elements used in theatrical lighting. However, taking sun as the main illumination reference and the desire to achieve realism on the scenery has limited their usage as special effects and Japan Kabuki theater.

Uplighting does not have an extensive application in providing illumination for interior living spaces. The reason is exactly the same of theatrical lighting. Physically and psychologically being conditioned by the sun's course is limiting the usage of uplighting. However, there are some advantages of being unfamiliar to the light coming form below.

When used indoors, luminaries fitted in the floor attract great attention since both the existence of lights in the floor and upright flow of light seems unusual. Therefore, lights in these locations can be used to achieve interesting lighting patterns to reveal selected architectural elements (fig. 5.3), to attract attention, and to orient the occupant (5.4).

In the last decade outdoor lighting has undergone a revival. Though uplighting has a limited usage in indoors, it is widely used in outdoor lighting. Due to its unnatural dramatic effect, uplighting is used in revelation of none human features such as buildings (fig. 5.5), landscape (fig. 5.6) and advertising elements. This angle of light became a natural complement to the vertical dynamic of modern urban architecture.

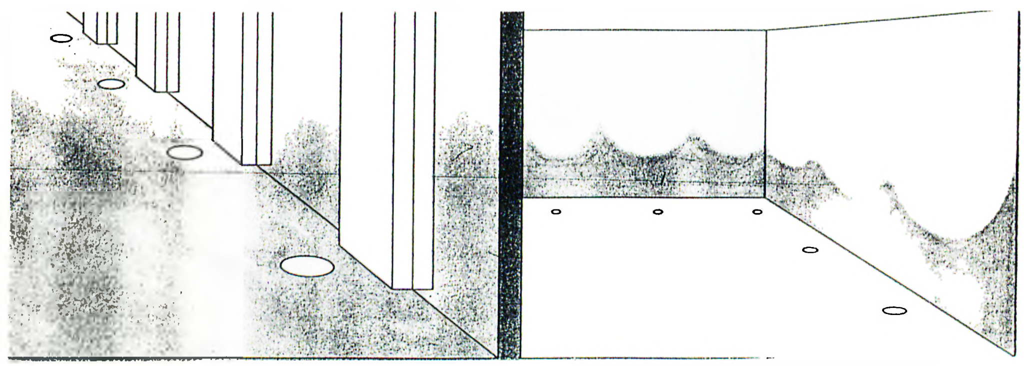


Figure 5.3

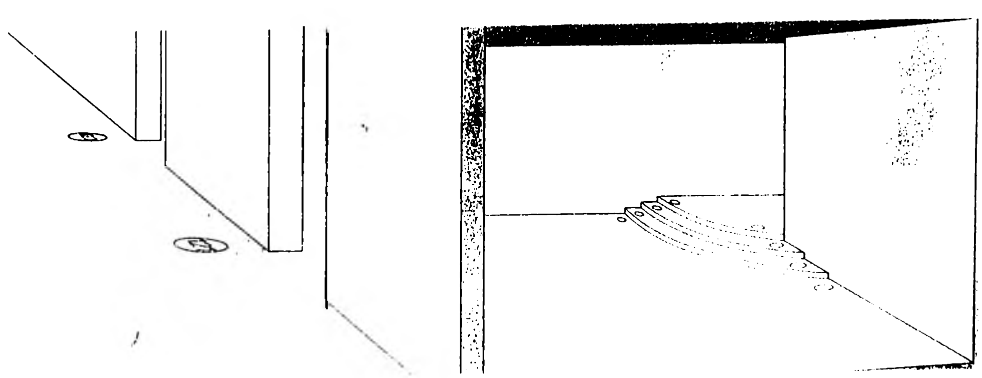


Figure 5.4

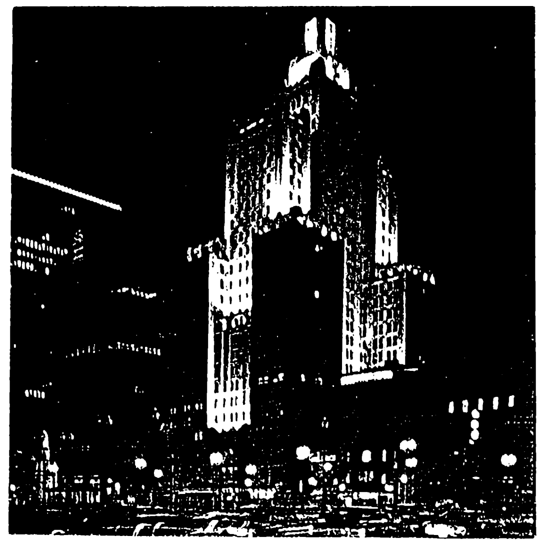


Figure 5.5

Figure 5.6

Since the application of electricity to stage lighting, FOH lights are the most common features of stage lighting. They provide a sufficient illumination mainly for the actors as well as general illumination. However, the most important role of front lighting is to reveal certain theatrical elements on the stage according to the decision of the director. This is also the basic principle of accent lighting that can be applied in many different spaces such as exhibition areas, museums, shop interiors, shop windows, multi purpose halls, restaurants, domestic spaces, etc. The high contrast achieved by accent lighting draws attention and determines how people behave in a space. With accent lighting it is possible to reveal a diamond in a shop window, as well as an automobile in an exhibition (fig. 5.7). Highlighting by the strong beams of light is also the principle of outdoor lighting. By this method it is possible to reveal important city elements such as statues sculptures, city furniture, etc. .

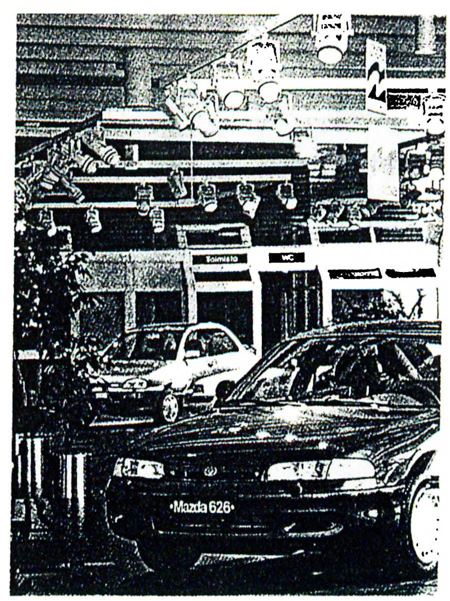


Figure 5.7

Down lights is another common feature of stage lighting, their main purpose is to contribute the general illumination by varying beam patterns. These lighting elements are widely used and have a very important role in stage lighting. They also represent the most significant transition between stage lighting and architectural lighting. In architecture downlights function in the same manner as it is in stage lighting. Their beam pattern can vary from spot beams (fig. 5.8) to diffused wall illumination (fig. 5.9). The use of different quality and quantity of light is very significant in architectural lighting, due to the need to emphasize different visual tasks in the same environment. Wallwashing is a significant downlighting technique that is similar to cyclorama lighting. It is used to enhance the size perception of the space by uniform wall illumination.

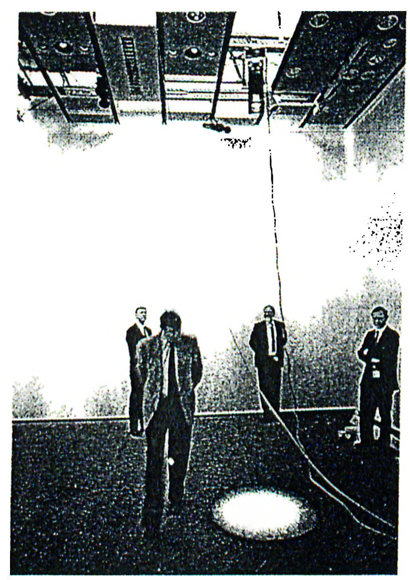


Figure 5.8

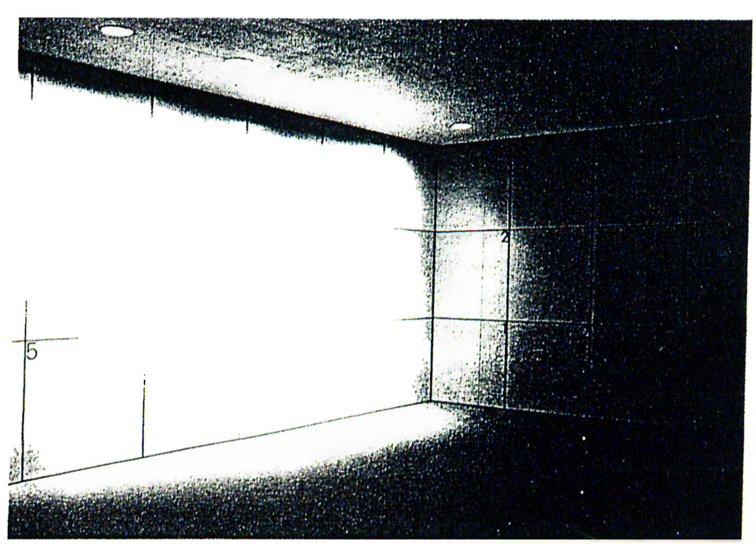


Figure 5.9

Backlighting is used to force three dimensionality by creating a haze around the actor or any scenic element. In architecture, backlighting is used exactly in the same fashion. It is used to increase the distinctness of the task off the background by sandwiching the object between the viewer and the light source. The object will be outlined by the light whose brightness acts as a negative space (fig 5.10). This technique can break up visual glare as well as enhancing the object. This form of lighting is generally used as one of the lighting method of signs and advertising panels. When there is a need to enhance the three dimensionality of the task, it is also possible to use backlighting technique as a supplement to accent lighting.

In architectural lighting, sidelighting is also used as a complementary technique to accent lighting as it is in stage lighting. It is mainly used to enhance the feeling of three dimensionality and reveals the objects off the background by creating a haze around it.

Figure 5.10

Projected scenery is in use since the beginning of the nineteenth century. Today projection is becoming popular among architectural lighting designers. The reason is its flexibility. One can achieve numerous effects by projectors equipped with custom design gobos or slides. The potential exists for enormous visual impact through extremely bright and optically excellent imagery for thematic programming, marketing and animated information on a canvas that is thousands of square centimeters of vertical surface (fig. 5.11).

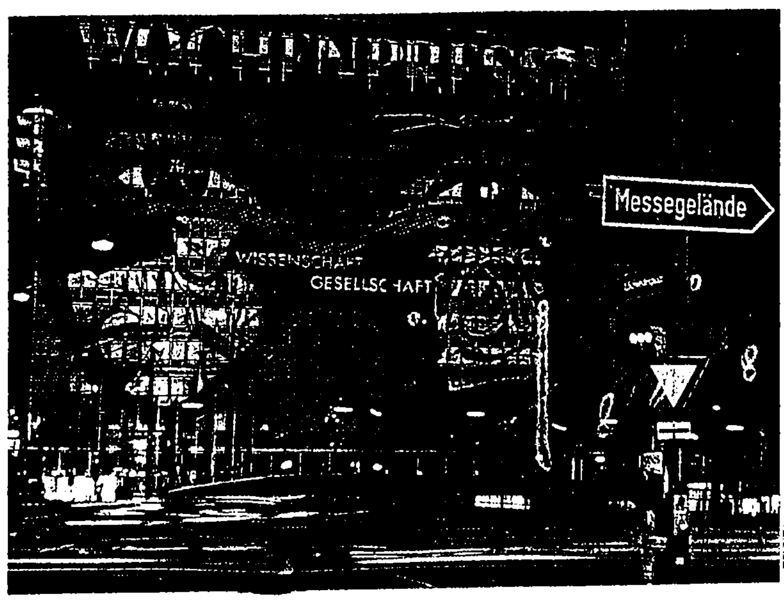


Figure 5.11

5.3 AFFECTS OF STAGE LIGHTING EQUIPMENT ON ARCHITECTURAL LIGHTING EQUIPMENT

The transition from stage lighting to architectural lighting is not limited by only the lighting techniques. Transformation of hardware from stage lighting to architectural lighting has been an ongoing process since the first practical incandescent spotlight developed by Louis Hartmann. The theater has been a major market for high technology and product development in light sources, fixture design, control systems. In most cases, that demand has brought many successful applications many decades before their adaptation as architectural lighting products.

As stated in the previous chapter, almost all kinds of light sources are used in stage lighting. Eventhough, most of them are not specially designed for this use, lighting designers adapted them to stage according to the needs. MR16 lamps can be a good example of this function shift. MR16 lamps are originally developed for slide projectors and airplane wing lights. However, lately the lamp is used as the basis of theatrical border lights and footlights. Today they are widely used in architectural lighting and display lighting.

Theatrical experiences proved that precise alignment of the beam, its shaping and coloring is very important to achieve the desired effect on the acting area. There are many kinds of beam shaping and coloring devices that are used in stage lighting for a long time. Boom in architectural lighting, encouraged the adaptation of theatrical lighting techniques. For this reason precise beam control is required to achieve the desired effect on or in the building. Consequently, all kinds of beam shapers transferred to architectural lighting as well as their spot lights. Today barn doors, funnels, shutters are successively adapted to architectural lighting units (fig. 5.12).

Due to its effect on the mental state of the observer, colored light is one the most important element of stage lighting. Therefore, light filtering technology is carried over to architectural lighting as an additional tool. Colored glass and gel filters are enhancing the designer's creditability for color effects and UV, and IR filters are reducing the possible damage due to those specific wavelengths of the spectrum.

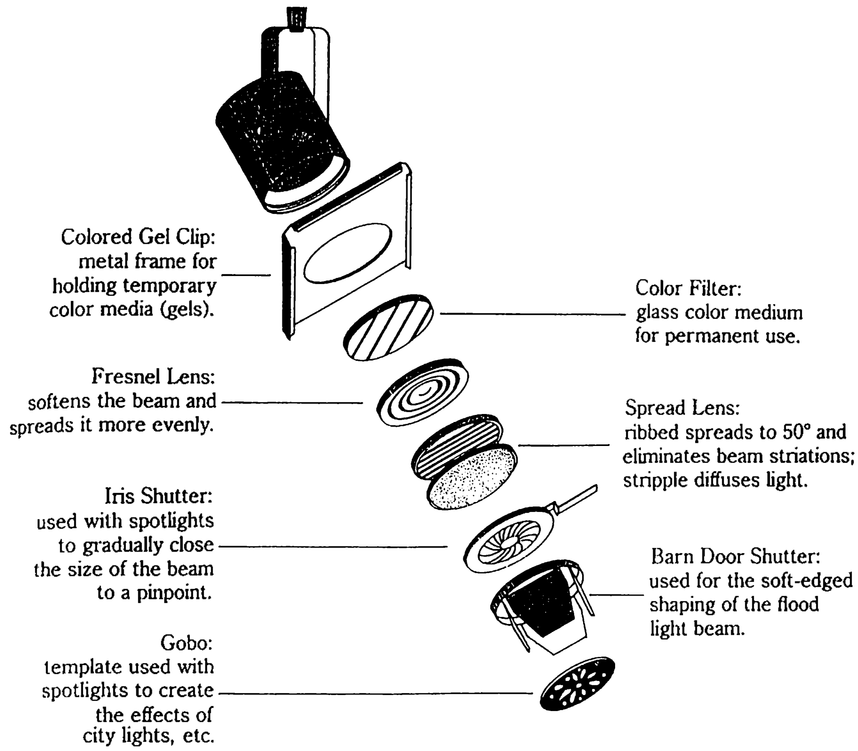


Figure 5.12

Theatrical equipment is transferred to architectural lighting under three main groups: washers, flood lights, and spotlights. These instruments transfer the drama of light to architecture that enhances the language of it. However they are transferred to architectural lighting as reduced size, power consumption along with increased life span, and safety factor.

There are many varieties of linear light sources in theater that are called striplights. They are used to provide smooth and even field of light for large vertical surfaces. In architectural lighting such instruments are often required as wallwashers. The fixture is incorporated with staggered placement, alternating very wide and flood lamp types, to wash the upper and the middle portion of walls. This technique provides even blending of different colors with complete uniformity of general downlight pattern.

Some of the stage lighting floodlights are transferred as washers to architectural lighting, due to their wide and smooth light pattern. With this dispersion, they are used for close–in, broad based illumination for large flat surfaces, such as indirect lighting off the ceiling.

The beam projector has been popular in theater for specific effects. In exterior architectural lighting this beam pattern is very useful to accent structures from extremely long distances. Consequently, the design features required sealing for safety when it is used in wet conditions.

The fresnel spotlight is another common feature of stage lighting. Due to its extremely soft pool of light along with variable beam characteristics, it is an excellent tool for architectural lighting. By an additional reflector it can be used as bi-directional wall washer to illuminate high walls uniformly from ceiling to floor.

The ellipsoidal spotlight is the work horse of stage lighting designer. Due to its precise beam control, and ability to make projections, it became an important element of architectural lighting. It is characterized by the multiplicity of light, color and projection effects that can be created and thus is the answer to many theatrical lighting techniques, adapted to architectural lighting. Due to its flexibility, it can be used to generate dramatic light in certain areas or evenly illuminate the walls.

There are often times when overall lighting plan cannot be carried out by one lighting concept. In the case of multifunctional spaces, different requirements may arouse in the environmental conditions according to different tasks. To meet different requirements, relating to the environment and usage, a lighting system needs to operate several dimming, and switching modes. Thus, one of the largest contributions made by the theater to architectural lighting has been in the area of dimming controls. As stated previously, the concept of movement in lighting systems is carried over to architecture from theater along with its technology. Today it is possible to preset different cues for different fixtures in varying time as well as controlling the color, shape, and the direction of the beam. Clearly all these transitions bring a new era to architectural lighting.

6 CONCLUSION

Theater is a free environment to experiment the effects of light. As stated in the second chapter, the earliest theater managers recognized the importance of lighting and they tried to achieve a controlled illumination on the stage. Today, the positive effects of successful lighting among the scenery are very well understood. The need for a specialist in stage lighting, as opposed to stage electrician has been recognized more than 30 years in theater.

As it is stated in the fifth chapter, light plays an important role in architecture. It is impossible to separate architecture from light as well as it is impossible to separate light from the context of design. Though, there are some good examples of successful lighting design applications; in our daily environment the manipulation of light is lack of design input. Light is concerned as tool only to provide sufficient illumination for the space. Mostly, the only design input is consisted of physical design of the luminaire; no one is concerned about the light quality, and distribution of it.

From lighting design point of view, theater is supplying a very good example. By considering the stage as a lighting laboratory, it is possible to generate new concepts that can be carried over to our environments. In this scope the role of interior architect is to be aware of the facts that creates the visual environment.

REFERENCES

Baron Robert A. and Rea Mark S. "Lighting to Soothe the Mood "Color and Illuminance Affect Our Moods." ID + A. Dec.(1991):30 - 32.

Bentham, Frederick. "The Development of Stage Lighting." The Art of Stage Lighting. 3rd ed. Bath: Pitman House Limited, 1980.

Billington, K and Hooker M. "Theatrical v.s. Architectural Lighting - Bridging the Gap." Lighting Design & Application Jan. (1983): 13 - 17

Brandston, H. "How Theatrical Lighting Influences Architectural Lighting." Lighting Design & Application March (1974):10-11

Brocket, Oscar G. History of the Theater. 5th ed. Massachusetts: Allyn and Bacon :1987.

Davis, Bob. "Frontlight Positions - an Informal Plea for Diversity"Frontlighting is like sex there is no ideal positions."" Lighting Design & Application. June (1975):62-68

Eddy, Michael S. "Color In Light, From Gelatin to Plastics and Beyond." Theater Crafts July (1990): 40, 100 –105

Eddy, Michael S. "Color In Light, Beyond Plastic Filters: A Look Ahead." Theater Crafts July (1990): 40, 105

Flynn, John E., et. al. " Luminous Environment." Architectural Interior Systems. 2nd ed.New York: Van Nostrand Reinhold, 1988.

Fisher, Jules. Interview. Lighting Design & Application March (1974): 4 – 9

Fisher, Jules. Interwiev "I Like to Dream"Looking for the Visual Lighting Methapor."" Lighting Design + Application. Dec. (1986):4, 5, 38 - 41

Fisher, Thomas. "Exterior Lighting " Night Lights."" Progressive Architecture. Sep. (1987): 150 –155.

Gassner, John, and Barber Philip. Producing the Play: New Scene Technician's Handbook. Rev. ed. New York: 1953.

Gillette, J. Michael. Theatrical Design and Production. Mountain View: Mayfield Publishing Company, 1987.

Hatch, Arthur J. " Upsating the Followspot" Ease of Operation and Simplified Maintenance are Two Reasons why the Xenon Short Arc is Replacing the Carbon Arcs as a Source For Follow Spotlights." Lighting Design & Application. March (1975):54 - 56

Hansen, Gregory C.. "Manual Lighting Control Boards, The state of the manual in a state of the art world." Theater Crafts. Feb. (1990): 34-37

Izenour, George C. Theater Technology. New York: Mc Graw Hill Publications, 1988.

Hazirjian, D. "Fluorescent: The Reemerging Video Technology." LD+A June (1993):15-19.

Heller, B. "Templates, Patterns in Light." Theater Crafts. Jan. (1990): 24-28

Kruger, Mark D. "Theatrical Techniques in Architectural Lighting "Light, like language can be a tool for expression." LD + A Oct. (1989): 4, 14, 15

Le Corbusier. "Three Reminders to Architects, 1 Mass." Towards a New Architecture. Trans. Frederick Etchells. New York: Pragaer Publishers, 1970

Lemons, M. Thomas. " The Latest in Sources." Lighting Design & Application. March (1974):40-43

Lemons, M. Thomas. "HMI Lamps." Lighting Design & Application. Aug. (1978):32-37

."Light Sources." IES Lighting Handbook 1984 Reference Volume. 1984 ed.

." Lighting Design" IES Lighting Handbook 1987 Application Volume 1987 ed.

."Lighting Systems Design Considerations" IES Lighting Handbook 1987 Application Volume 1987 ed.

Loeffler, Mark. "Shedding a New Light, The Latest in Lamps for the Stage." Theater Crafts. Aug/Sep. (1989): 73-76

McCandless, Stanley. A Method of Lighting the Stage. New York: Theater Arts Publishers, 1932.

McIntosh, C. "Trip the Light Fantastic." LD+A Dec.(1990): 24-27

Morris, Neal. " Mood Pieces." Design. May (1989): 33-35

Nuckolls, J. L. Interior Lighting for Enviromental Designers. New York: Wiley Interscience Publications, 1976.

O'Mahony, T. "Light as Emotion; as Aesthetic." Lighting Design + Application. Sep. (1985): 25

Pagiani, L and Perversi, A. "Luminous Interiors" Interni Annual Luce 89 – 90. :43-46.

Parker, W. Oren and Wolf, R. Craig. "Light Sources." Scene Design and Stage Lighting. 6th ed. Forth Worth: Holt, Rienhart and Watson, Inc., 1990

Pollock, S. "Remote Controlled Luminaries" Theater Crafts. Oct. (1986): 30, 31,67-74

Pollock, S. "Little Lamps, Lots of Punch" Theater Crafts. April (1985): 35, 45–49.

Pollock, S. "Are They All the Same" Theater Crafts. Oct. (1985): 30-36,64-84

Ralph, Holmes. "Staging And Stage Design." Encyclopedia Britanica: Macropedia. 1978.

Ralph, G. Hopkinson. "Lighting and Lighting Devices" Encyclopedia Britanica: Macropedia. 1978.

Ruling, Karl G. "Color In Light, Part 2." Theater Crafts Aug./Sep. (1990): 42, 43, 79

Ruling, Karl G. "Mixed Media Luminaries" Theater Crafts Oct. (1990): 52 - 56

Schelling, William F. "HID Lamps for Television Remotes." Lighting Design & Application. April (1979): 2 - 5

Sonnenfeld, N. J. and Gilchrist, D. C. " Stage Lighting – A Guide to the Planning of Theaters and Public Building Auditoriums." Lighting Design & Application. Sep.(1983): 17 – 26.

Smith, Fran K. "Analyzing the Project" Bringing Interiors to Light New York: Whitney Library of Design, 1986

Stevens, W. R. "Motion Picture Studios and Stage Lighting." Principles of Lighting. London: Constable and Company Ltd., 1951.

Tammes, A. "Take a Cue from Theater." Design. Aug.(1983): 38 – 40.

."Theater, Television and Photographic Lighting" IES Lighting Handbook 1987 Application Volume 1987 ed.

Vonnio, Vanni. Interview. "Let Light Join the Feast, Footlights." Interni Annual Luce 90-91 with Cecilia Fabiani Sep. (1990):28-31

Watson, Lee. "Sources, Luminaries, and Lighting Equipment." Lighting Design Handbook. New York: Mc Graw Hill, Inc., 1990

Wells, H. T., eds., et al." A Glossary of Comonly Used terms in Theatre, Television and Film Lighting." Lighting Design & Application. Nov. (1983): 43-48

Wolf, Fred M. "Lights have Starred on Broadway" Evolution of Theatrical Lightign Equipment."" Lighting Design + Application. Dec. (1975): 18 -30

Woodson, Wesley E. "Lighting"Lighting System Design." Human Factors and Design Handbook. New York: McGraw – Hill Book Company, 1981.

Zekowski, G. "The Art of Lighting is a Science/The Science of Lighting is an Art "Part 1- Seeing is not Believeing." Lighting Design + Application. Jan. (1981): 10 - 15.

APPENDICES

APPENDIX A

ACTING AREAS / WARM

The color range here includes amber, pink, straw, and salmon, with several choices in each color category. These colors are often cross lit with those recommended for cool acting areas. The warm colors suggests daylight and brightness. They are generally used for scenes set in the morning or noon.

Color	Applications
Amber	Especially useful when crosslit with a cool color. Excellent for sunlight.
Pale Gold	Good where a tint of color is needed. Excellent for neutral skin tones.
Rose	Excellent area light and warm cosmetic color.
Light Straw	Excellent realistic sunlight in a light colored show.
Medium Straw	Warmer straw. Flattering to skin tones. Useful for dance.
Light Salmon Pink	Excellent for general area washes. Gives overall warming effect to skin tones.
Salmon Pink	General wash. Good for followspots. Useful in warm and cool combination.

ACTING AREAS/COOL

Blue and violet are the color on the cool side of the spectrum. There are probably more shades of blue presented in Supergel and Roscolene than any other color because virtually every stage production requires some blue in the palette.

Color	Applications
Mist Blue	Excellent for general area washes. Very light cool tint of blue. Helps maintain white light when dimmer is at low level.
Steel Blue	Useful beams of realistic moonlight.
Daylight Blue	Useful in achieving depressed moods and dull skies.
Water Blue	Good cold light. Pale greenish blue, useful moonlight source.
Light Sky Blue	Excellent sky color. Useful for cyc and borderlights
Nile Blue	Useful for light midday skies.

ACTING AREAS / NEUTRAL

These colors in the lavender, gray, and blue ranges, work as complementary colors for both the warm and cool area colors or where just a touch of color is desirable.

Color	Applications
Light Lavender	Good on costumes when the instruments are down on dimmer. Excellent for general area or borderlight washes. It is a basic follow spot color
Lavender	Gives good visibility without destroying night illusions.
Deep Lavender	Excellent backlight. Enhances dimensionality.
Light Gray	Usually used in combination with light tints of color. Reduces the brightness of color
Medium Gray	but does not effect hue on saturation. Useful where dimmer control or lower wattage lamp is not practical.
Light chocolate	Warms light and reduces intensity.

ACCENTS/WARM

These colors which embrace a wide range of yellow, amber, pink, orange, and magenta, are frequently used in sidelights, downlights, and backlights. They add a warm cast while sculpting actors, scenery, or props with light.

Color	Applications
Medium Yellow	Good for special effects. Accent unflattering in acting areas.
Medium Lemon	Unflattering in acting areas. Useful for contrast lighting, accents, hot day sunlight.
Light Straw	Pale yellow with slight red content. Useful for candle effects. Can be used for area lighting. For bright day feeling.
Medium Straw	Sunlight, accents, area lighting with caution to skin tones.
Deep Straw	Useful for special effects such as candlelight and firelight. Tends to depress color pigment values.
Light Amber	Dark pink amber. Deep sunsets.
Meduim Amber	Afternoon sunlight, lamplight, candelight, Tends to depress color pigment values.
Dark Amber	Useful for torchlight and light from wood fires. Use with great care. Destroys most pigment color values. Useful as amber cyc light and late sunsets.
Orange	Provides a romantic sunlight through windows for evening effect.
Pink.	Basic follow spot color. Useful in live entertainment situation and as strong accent. Subdued sunlight effect. Useful in backlights.
Rose Purple	Pale evening color. Excellent for backlight.

ACCENTS/COOL

The shades of blue and green are widely used in evening or moonlight scenes. Like warm accent colors, they are most frequently used in sidelights.

Color	Applications
Blue	Excellent for early morning tones. Popullar among desingers for cyc and borders. Used for dramatic moonlight effects. Primary blue is used for three color cyc lighting system.
Yellowgreen	Good for dense foilage and woodland effects.

CYC/SKY

The colors chosen for this goup are often used for other purposes, but shades of amber, red, blue, and green work particularly well on cycloramas. Cycs are generally used to set the horizon of the scene. Some stages use blue colored material for their cycs, and these should be lit only with blue or green filters.

Color	Applications
Amber	Useful for torchlight from wood fires. Use with great care. Destroys most pigment color values. Useful as amber cyc light and late sunsets.
Deep Amber	Very useful as a backlight.
Red	Red primary for use with three color light primary systems in cyclaroma lighting.
Medium Purple	Midnight an moonlight illusions. Enforces mystrious mood. Useful for evening cyc wash.
Blue	Excelent sky color. Useful for cyc and border.

APPENDIX B

A

Ace: a 1OOO-W Fresnel spotlight.

Arc: a discharge light source, usually a carbon arc. See also HMI, *CSI, tin halide* and *xenon.*

Area lighting: the practice of lighting the acting space in separately controlled areas.

Asbestos tapoff: see *twofer.*

B

Baby: once a 250- to 400-W plan convex spotlight with a four- to five-inch lens diameter. Now usually a 500- to 1 OOO-W Fresnel spotlight with a six-inch diameter lens, standard in the motion picture industry. Also a small version of any spotlight.

Back light: illumination from behind (and usually above) a subject to produce a highlight along its edge and consequent separation between the subject and its background. Syn *Fringe, halo, contour* or *hair light.*

Backing lighting: the illumination provided for scenery in off-stage areas visible to the audience.

Balcony lights: luminaries mounted on the front edge of the auditorium balcony. Syn *rail lights, FOH spots.* bank 1: a group of switches and/or dimmers that may be controlled together. 2: a group of luminaries.

Barn doors: a set of adjustable flaps, usually two or four (two-way or four-way) that may be attached to the front of a luminaries (usually a Fresnel spotlight) in order to partially control the shape and spread of the light beam.

Base light: 1: uniform, diffuse, near shadowless illumination sufficiently intense for a television or film picture of acceptable quality at a desired lens opening. 2: acceptable base level of unaccented stage illumination.

Batten: 1: Pipe batten. Horizontal pipe hung from a line-set of a flying system. 2: Wooden batten. Top and bottom of roll drop.

Beam angle: the included angle between those points on opposite sides of the beam axis at which the luminous intensity from a luminaries is 50 percent of maximum. This angle may be determined from a candlepower curve, or may be approximated by use of an incident light meter.

Beam lights: luminaries mounted in the ceiling of the auditorium, often concealed by a false beam. Syn *FOH spots.*

Beam Port: A front-of-house lighting position located in the ceiling of the Beam

Projector: a luminaire with the light source at or near the focus of a paraboloidal reflector producing near parallel rays of light in a beam of small divergence. Some are equipped with spill rings to reduce spill and glare. In most types, the lamp may be moved toward or away from the reflector to vary the beam spread. bed: platform usually suspended from above to provide lighting positions on motion picture stages.

Black light: 1: ultraviolet illumination. 2: a luminaire supplying ultraviolet for effects.

Blackout: to switch off all illumination (except exit lights).

Blending lighting: general illumination used to provide smooth transitions between the specific lighting areas on a stage.

Bloom: Specular reflection from mirror or highly polished surface.

Board : a switchboard, control board, dimmer board.

Boomerang: *[boom]* 1: a vertical spotlight mounting pipe, usually located at the side of the stage or auditorium (i.e., box booms). 2: a device mounted on the front of a spotlight that enables an operator to change the color media rapidly and easily, often from the rear of the unit. 3: a telescoping device used to hold and position a microphone above a set.

Boom shadow: a visible shadow caused by presence of the microphone boom in a beam of light.

Borderlight: a long continuous striplight hanging horizontally above the stage and aimed down to provide general diffuse illumination and/or to light the cyclorama or a drop. usually wired in three or four color circuits.

Bounce: Reflected diffuse light off the floor or walls.

Box Booms: Lighting booms located in front-of-house box-seat positions .

Bridge (light bridge): a suspended mounting position and catwalk located behind the proscenium arch providing access to and a mounting for stage lighting units.

Brightness ratio: ratio of maximum to minimum luminances occurring within a square.

Broad: a floodlight with a fixed or variable beam used as a source of fill light.

Brute: a 225-ampere dc high intensity carbon arc spotlight with a 24-inch (61-millimetre) diameter Fresnel lens.

Bump-up: Sudden movement of lights to a higher intensity.

C

Carbon arc: an ac or dc arc light source. *Seefollow spot* and *brute.*

Camera light: a lighting instrument mounted on a camera for lighting on the optical axis, usually to provide eye light.

Channel: A lighting control path. *Channel* replaces the term *dimmer* in modern usage.

Circuit: Established paths of electricity.

Color frame: a removable metal frame used to support color media at the front of a luminaire.

Color media: colored transparent material. Currently in use are glass, gelatine and various plastics.

Color wheel: a device holding several different color media that can be rotated by hand or motor to change the color in front of the luminaire.

Cookie: see *cucoloris.*

Concert border: a borderlight mounted immediately behind the proscenium arch and the act curtain.

Console: the desk/panel position from which production lighting is controlled, containing all master controls, fader controls and other components needed in production.

Contour light: see *back light.*

Control board: an electrical panel containing controls for production lighting, including dimmer controllers, faders, nondim switches. etc. See *dimmer board* and *console.*

Counter-key light: illumination on a subject from a direction that is opposite to that of the key light.

Cross Fade: To fade from one lighting set-up to another without going through a dimout.

Cross lighting: illumination from two sources on opposite sides of the subject. Often different color media are used in the luminaries for a given area to give the illusion of shadow while providing sufficient illumination for good visibility.

CSI *[compact source iodide]:* an ac arc light source utilizing a mercury vapour arc with metal halide additives to produce illumination in the 4000 to 6000 Kelvin range. Requires a ballast and ignition system for operation.

Cucoloris: an opaque cutout panel mounted between a light source

Cue: A visual or audible signal from the stage manager to execute a predetermined movement of lights or scenery.

Cutter: see *gobo.*

Cyc: Short for cyclorama.

Cyclorama *[cyc]:* a vertical surface used to form a background of apparent infinite depth. It is evenly illuminated in order to produce this effect with striplights and/or scoops from above and below. Those luminaires below the *cyc* may be recessed below stage level in a pit designed for the purpose.

D

Daylight conversion filter: a filter designed to modify the spectral energy distribution of a light source to produce illumination of approximately photographic "daylight."

Deuce: a 2000W Fresnel spotlight. dim: to reduce the illuminance produced by a luminaire. Though mechanical means may be used, the usual reference is to the use of an electrical dimmer. See *iris.*

Diffusion: A plastic medium placed in the color holder of a spotlight to break up the light in a variety of ways.

Dim: Change the intensity of a light, either brighter or less bright.

Dimmer: a device used to control the intensity of light emitted by a luminaire by controlling the voltage or current available to it. Currently available types are resistance, autotransformer. magnetic amplifier. thyratron tube and silicon controlled rectifier or switch (triac). The latter three types can be remotely controlled and thus, are subject to mastering, presetting and group fading.

Dimmer board: a panel board containing switches. dimmers and outlc fer the luminaries to be controlled. A control board or switch board.

Dimmer dot: a small round gobo.

Double broad: a two-lamp flood light usually of rectangular shape, used as a source of fill light.

Douser: Mechanical means of putting out a light.

Dowser: a cut-off shutter, usually in a carbon arc spotlight, that protects system so that the luminaire can be used as an effect projector.

Downstage: The area nearest the footlights and curtain.

Dutchman: 1: Condensing lens in a lens projector.

E

Effect projector 1: a luminaire incorporating a light source of high luminance. 2: a lens system to provide an even field of illumination at an aperture and a second lens system to project the image of this aperture on a plane surface with a minimum amount of geometric distortion. Slides, moving film, or rotating discs may be used in the aperture to provide still or moving effects.

Electrician: the stagehand responsible for execution of production lighting.

Ellipsoidal reflector spotlight: a spotlight in which a lamp and an ellipsoidal reflector are mounted in a fixed relationship directing a beam of light into an aperture where it may be shaped by a pattern, iris, shutter system or other insertion. The beam then passes through a single or compound lens system that focuses it as required, producing a sharply defined beam with variable edge definition.

ERF: Stage jargon for ellipsoidal reflector floodlights.

ERS: Stage jargon for ellipsoidal reflector spotlights.

Eye light: illumination on a person to produce a Specular reflection from eyes, teeth, jewellery, etc. without significantly increasing the total illumination on the subject.

F

Fade: a controlled change from one level or set of levels to another. May refer to lighting as a fade from one dimmer setting or set of readings to another, or to audio- or video-level changes.

Fay light: a Luminaire that uses incandescent parabolic reflector lamps with a dichroic coating to provide "daylight" illumination.

Field angle: the included angle between those points on opposite sides of the beam axis at which the luminous intensity from a luminaire is ten percent of the maximum value. This angle may be determined from a candlepower curve, or may be approximated by use of an incident light meter.

Fill light: illumination added to reduce shadows or contrast range.

Fill Light Wash: or soft light that fills in the light on the face from the direction opposite the key light.

Filter: a component of an electronic dimmer used to control electromagnetic or radio-frequency interference. See *color media.*

Fiver [or *five* K]: a 5000-W Fresnel spotlight.

Flag: opaque material placed in front of a light source to produce a shadow in the area illuminated. See *gobo.*

Flood 1: to adjust a luminaire usually by moving the lamp closer to the lens. 2: enlarging the diameter of the beam of light emitted. 3: the widest field of illumination from a luminaire.

Floodlight: a luminaire consisting of a lamp and spread reflector with resultant field angle greater than 100 degrees. Fixed and variable beam types are available. See *scoop.*

Floor pocket: an electrical outlet or group of outlets recessed in the floor beneath a hinged cover so notched that cables plugged into these outlets may pass up through the notches of the closed cover.

FOH Spots *[Front-of-house]:* luminaries mounted in auditorium or front-of-house positions. See *beam lights, rail lights, balcony lights.*

Follow spot *[light].* any instrument operated so as to follow the movement of an actor. Follow spots are usually high intensity controlled beam luminaries.

Footlights: a set of striplights at the front edge of the stage platform used to soften face shadows cast by overhead luminaries and to add general toning lighting from below .

Follow Cue: A cue timed to follow an original cue so quickly it does not warrant a separate cue number.

Fresnel: (correctly pronounced Fresnel) A lens recognized by its concentric rings. The spotlight designed to use this lens.

Fresnel spotlight: a luminaire containing a lamp and a Fresnel lens (stepped "flat" lens with a textured back) which has variable field and beam angles obtained by changing the spacing between lamp and lens (flooding and spotting). The Fresnel produces a smooth, soft edge, defined beam of light.

Fringe light: see *back light.*

Front lighting 1: light from the front or viewer's side of a performance. 2: FOH lights.

Frost: *see* Diffusion.

Funnel: a metal tube that can be mounted on the front of a spotlight to control stray light. Syn snoot, high hat, top hat.

G

Gel: a color medium made from gelatin. Sometimes used as generic name for color media.

General illumination: diffuse illumination of large areas with floodlights or striplights.

Globe: an incandescent lamp.

Gobo 1: in theatre, a metal cutout pattern of suitable size to fit in the holder or

aperture of an ellipsoidal reflector spotlight. 2: in motion pictures, it is a flag, usually opaque, that can be made with diffusing
material. 3: an opaque diffusing cookie. See *cucoloris.*

H

Halation: Undesirable spreading of light from a spotlight. A halo of light around the beam.

Hair light: see *back light.*

Half scrim: see *scrim.*

Halo light: see *back light.*

Hard light: light that causes an object to cast a sharply defined shadow.

Head Spot: Very narrow beam from a spotlight focused on an actor's head. Also called *pin spot.*

High key lighting 1: applied to a scene, a type of lighting that results in a picture having graduations from middle gray to white with comparatively limited areas of dark gray and black. 2: intense overall illumination in motion pictures. 3: high level accent lighting with strong contrast (dark deep shadows with little or no middle gray).

High hat: *see funnel.*

House lights: the general lighting system installed in the audience area (house) of a theatre, film or television studio or arena.

HMI *[hydrargirum, medium-arc-length, iodide]:* an ac arc light source utilizing mercury vapour and metallic iodide additives for an approximation of daylight (5600 Kelvin) illumination. Requires a ballast and ignition system for operation.

I

Incandescent: refers to a light source that radiates visible light from a heated filament (usually tungsten). The range of color temperature in theatre, television

Lighting designer: one who plans lighting compositions. lays out hanging plans, directs the focusing of lighting units and determines the various intensities, colors, and cues required in a production. Television term is LD.

Lighting instrument: see *luminaire.*

Light leak: Unwanted spill from an instrument or through scenery.

Linnebach projector: a lensless scenic projector, using a concentrated source in a black box and a slide or cutout between the source and the projection surface.

Loader: usually a plano-convex spotlight with lens removed used as a phantom load.

Low-key lighting: Applied to a scene. a type of lighting that results in a picture having graduations from middle gray to black with comparatively limited areas of light grays and white.

Luminaire: a complete lighting unit consisting of a source or sources together with the parts designed to collect and distribute the light, to position and protect the lamps or sources and to connect them to the power supply.

M

Martingale: see *twofer.*

Master: a control, switch or dimmer controlling a number of individual control devices or a number of submasters, each of which controls a number of individual devices.

Mat shutter: or matting material over the face of a spotlight to change the shape of the beam.

Matte: having a dull or diffuse surface finish that reflects light uniformly in all directions.

Memory: a device for storage of intensity information for combinations of luminaries (cues or presets) for use during the course of a production. Originally and motion picture lamps is 2800 to 3400 Kelvin.

Inky: a small Fresnel spotlight with a 1.5- to 3-inch (38- to 76-millimetre) lens diameter. Also any incandescent luminaire.

Instrument: see *luminaire.*

IR: Infrared.

Iris: an assembly of flat metal leaves arranged to provide an easily adjustable near-circular opening, placed near the focal point of the beam (as in an ellipsoidal reflector spotlight), or in front of the lens to act as a mechanical dimmer as in older types of carbon arc follow spotlights.

K

Key light: the apparent principal source of directional illumination of a subject.

Keystoning: Distortion of a projected image when the projector is oblique to the screen.

Kicker: an instrument used to provide an additional highlight or accent on a subject.

Klieglight: A type of spotlight sold by Kliegl Bros. *Klieg is* often used as a synonym for any bright light.

L

Ladder: a ladder-like luminaire mounting assembly hung in the wings of a theatre, often with a cable-fed outlet box.

Lamp: 1: Correctly, the name of what is often called a light bulb. 2: In the commercial theatre the term for any lighting instrument, particularly a spotlight.

Leko: see *ellipsoidal reflector spollight.*

Lekolite: A type of spotlight sold by Strand Lighting. *Leko* is often used as a generic term for any ellipsoidal reflector spotlight.

accomplished by potentiometer arrays (presets), now usually volatile or nonvolatile electronic elements.

Midget: see *inky.*

Modeling light: that illumination which reveals the depth, shape and texture of a subject. Key light, cross light, counter-key light, side light, back light, and eye light are types of modeling light.

N

Nonlens spotlight: a beam projector light source in fixed relationship to a parabolic reflector that often has a mask to prevent direct illumination from the light source.

O

Olivette: old stand floodlight.

P

PAR: Short for parabolic aluminized reflector lamp.

Parabolic spotlight: see *beam projector.*

PAR Head: Slang for PAR 64 lighting instrument.

Pattern spotlight: an ellipsoidal reflector spotlight, especially one with a pattern or "gobo" slot at the focal point of the unit to permit insertion of pattern templates for projection.

P-C: plano convex lens or lighting instrument.

Pipe: see *batten.*

Picture: The general composition of the setting as seen from the average sightline seat.

Plano-convex spotlight: a spotlight embodying a plano-convex lens and a lamp movable within the housing in relation to the lens in order to vary beam and field angles.

Practical lamp: a luminaire used on a setting to provide an apparent source of illumination, i.e., desk. table or floor lamp.

Profile spotlight: see *ellipsoidal reflector spotlight.*

Q

Quartz *[quartz iodine* and *quartz halogen]:* see *tungsten-halogen.*

Quartz-iodine: early name for what is now known as the tungsten-halogen lamp.

Quartz lights: generic term for small luminaries of various types (usually open reflector) that utilise tungsten-halogen lamps.

R

Rail lights: see *balcony lights.*

Raked: scenery or stage floor angled to the footlights.

Rear screen projector: an effect projector that is designed to project images to a translucent screen from the rear.

Roundel: round cast glass color medium, often used in borderlights. Also available as a clear cover glass.

S

Scenic projector: see *effect projector.*

Scenography In European theatre, *scenographie* / Literally, the graphics of scenery, drawing, and painting. In modern usage, combining the design of scenery, lighting, and costumes into a single visual concept.

Scoop: a floodlight consisting of a lamp in an ellipsoidal or paraboloidal matte reflector, usually in a fixed relationship, though some types permit adjustment of the beam shape.

SCR: Silicon Controlled Rectifier.

Scrim 1: material used in the beam of a luminaire to modify the beam shape, intensity and/or shadow characteristics. Also available as half-scrim to cut intensity of only one half of the beam usually with wire screen. 2: material used as a stage curtain which appears opaque when illure.inated from the viewing side and becomes transparent when illumination is reduced and a higher level provided behind the scrim.

Sealed beam spotlight: a light source with integral filament, reflector and lens .

Set light: separate illumination of background or scenic elements.

Sharp Focus: narrow-beam focus of a spotlight.

Shutter: a beam-framing device located at the aperture of an ellipsoidal reflector spotlight.

Side-back light: illumination from behind the subject in a direction not parallel to a vertical plane through the optical axis of the camera.

Side light: lighting from the side to enhance subject modeling and place the subject in depth; apparently separated from background.

Sightline: line of sight from an audience seat to a point on stage. In perspective, line of sight to a point on object from observation point.

Slash: a diagonal beam of side lighting on a stage drapery or window curtain creating an arbitrary pattern of light.

Snoot: *see funnel.*

Soft light 1: diffuse illumination that produces soft edged poorly defined shadows on the background when an object is placed in its path. 2: a luminaire designed to produce such illumination.

Specific illumination: illumination of localized areas by means of controlled illumination.

Spot 1: to adjust a luminaire, usually by moving the lamp away from the lens, reducing the diameter of beam of light emitted. 2: the narrowest beam possible from a focusable light. 3: a spotlight.

Spot Focus: narrow beam focus.

Spotlight 1: any of several different types of luminaires with relatively narrow beam angle designed to illuminate a specifically defined area. 2.: [in motion pictures] generic for Fresnel lens luminaires.

Striplight 1: once an open trough reflector containing a series of lamps. 2: now usually a compartmentalised luminaire, with each compartment containing a lamp, reflector and color frame holder, wired in rotation in three or four circuit and used as borderlights, footlights or cyclorama lighting from above or below. Often in short [3- to 8-foot (.9- to 2.4-meter)] portable sections.

T

Tenner (or *ten-K):* a ten-kilowatt Fresnel spotlight.

Throw: the distance between a luminaire and the area or subject being i, lighted.

Tin halide (chloride): an ac arc light source where radiation is emitted by tin monohalide molecules in an approximation of daylight (5600 Kelvin) illumination. Requires a ballast and ignition system for operation

Tonal lighting: set lighting.

Top hat: *see* Funnel.

Top light: illumination of a subject directly from above employed to Outline the upper margin or edge of the subject.

Tormentor lighting: luminaries mounted directly behind the sides of the stage arch.

Tungsten-halogen: incandescent light sources utilizing the halogen regenerative cycle to prevent blackening of the lamp envelope during life. Usually more compact and longer life than comparable standard incandescent sources. Also called *quartz, quartz iodine, quartz halogen* or *halogen types.*

U

Up and down: reference to scenery sitting perpendicular to the footlights.

Unit (lighting): a luminaire.

UV: Ultraviolet.

W

Wash: low angle front-of-house lighting sources which illuminate in a general manner.

Wing: in the commercial theatre the term *single wing* refers to the basic unit of framed scenery, commonly called a *flat* in the noncommercial theatre.

Wings: area offstage right and left, stemming from the era of wings and backdrops.

Work light: illumination provided for specific operational purposes independent of the production lighting such as cleaning and set construction.

X-Rays: old expression designating the first row of border lights.

Z

Zone: a single stage-left to stageright lighting area; most often used in dance lighting.