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# Stage Lighting Design

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## PART 3 - Applied Design Methods

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### 3.01 - STAGE LIGHTING DESIGN

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#### 1.) INTRODUCTION

Traditionally when we speak of stage lighting we usually think of lighting as applied to 'legitimate' stage productions that take place in an actual theatre. As performing arts and entertainment developed throughout the 1900's, stage lighting became far more than 'just lighting plays'. New lighting specialties were born and new lighting standards were set for; opera, ballet, modern dance, live concerts, ice shows, industrial shows, television and other 'live' presentations. STAGE LIGHTING has to do with the controlled and applied use of light to move an audience emotionally and involves far more than just lighting the stage for visibility.



Today modern performance facilities are just as varied as the styles of performance that take place inside them. Facilities include many types of theatres, auditoriums, concert halls, arenas, stadiums, shopping malls and other conventional and non conventional venues.

Most commercial events (theatre, dance, opera) usually take place in an actual theatre. This is a very good thing as usually a theatre is the only controlled environment able to withstand the very demanding requirements of staging, audience comfort, acoustics and hopefully proper lighting.

More and more today producers are taking the show out of the theatre and into the arena. The much larger arena audience can generate far more revenue for a single show, however conditions in most arenas are usually much less than ideal. In order to provide the audience with the best lighting (and sound) possible in these problematic spaces, a tremendous amount of equipment is often required. A simple show in a theatre might require 24-100 lighting fixtures. The same show in an arena might require 300-500 fixtures. Arena shows have become very hi-tech, energetic and highly creative in recent years. New tools including the automated lighting fixture and the color changer has brought a new dimension to stage lighting design, never before seen.

Today the stage lighting designer has evolved into the ENTERTAINMENT LIGHTING DESIGNER. This new generation of designer will usually work in a wide variety of venues, performing continuous miracles for an endless number of different events. Following is a general overview of basic lighting methods for a number of performance and non-performance related industries. For information, we also include: display lighting, architectural lighting, landscape lighting, photographic lighting and museum and gallery lighting.

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## 3.02 - THEATRE LIGHTING DESIGN

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### 1.) THEATRE LIGHTING

Lighting for the theatre usually means design for a wide range of different types of productions, presented in theatres or spaces designed to function as a theatre. Productions may include dramatic plays, comedies, tragedies, musicals, concerts and reviews. The ' typical' theatre may range from a traditional proscenium type of theatre, to a ' thrust' , asided stage, a 4 sides stage or no stage at all. Seating may range from 200 seats in a small school theatre to over 2500 seats in a large municipal auditorium.



Small productions in community halls might use 12 - 20 lighting fixtures. A typical professional production might use 48 - 200 fixtures. Today it is now not uncommon for the large ' megamusicals' to use 500 fixtures or more. The Broadway production of ' Lion King' apparently used 700.

### 2.) THEATRE HANGING POSITIONS

Effective stage lighting depends very much on the equipment mounting positions that are available in a space. Most theatres usually have permanently installed lighting positions (or pipes). Several positions are usually installed above the audience for front lighting the stage (sometimes called ' Ceiling Coves' ). Other auditorium lighting positions usually include ' Box Booms' (vertical pipe adjacent to the proscenium) and a ' Balcony Rail' . All lighting located in the auditorium is referred to as ' FOH' lighting (Front of House).

Other positions are installed above the stage and usually consist either of a fixed pipe grid or a system of motorized (or counterweight) pipes. Lighting distances (to the stage) typically will range 30-80 feet for equipment mounted above the audience, and 20-40 feet, for equipment mounted above the stage. Additional lighting fixtures are often used on the floor to ' uplight' backdrops, or as footlights (less often in recent years). The use of Box Booms, Tormentor Booms and portable Stage Booms as a method of mounting fixtures, is also quite common.

### 3.) THEATRE LIGHTING - TECHNIQUES

Most theatre lighting methods are ' loosely' based on the McCandless method; first light the actor for visibility, then light the scenery, and backgrounds for atmosphere and interest. McCandless also put forward a simple method of AREA lighting for the proscenium stage. This method divides the stage into a number of smaller areas and then provides each area with 2 front lights mounted some distance apart. Fixtures must be accurately placed to give appropriate lighting angles and direction of light to the actor. Areas must also be controlled in size, to avoid unnecessary ' spill' light on adjacent areas or scenery. A front light at 70 degrees (horizontal) to an actor may be well suited to a dramatic production, while a lower angle of 50 degrees might be better suited for a comedy. If the actors are all wearing hats, then a front light of no more than 45 degrees may be necessary, in order to provide more light to their faces.

#### 4.) THEATRE EQUIPMENT TYPES

The designer must carefully choose fixtures that work efficiently from a specific lighting position (distance). For most general stage lighting applications the designer will work with only about five (5) basic equipment types. Each type however is available in a number of different wattages, lens diameters and beam spreads. The basic equipment types used in theatre lighting are: The FRESNEL, ELLIPSOIDAL and PAR spotlight, the BOX FLOODLIGHT and the STRIPLIGHT. Typical wattages are 500-2000 watts. The FOLLOWSPOT is also sometimes used for very stylized plays or comedies.

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### 3.03 - DANCE LIGHTING DESIGN

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#### 1.) DANCE LIGHTING

Lighting for dance is taken to mean all forms of performance dance, including; Ballet, Modern, and Contemporary. More traditional forms of dance are often presented under the controlled conditions of a proper theatre, with complete technical and lighting facilities. Other forms of dance (Modern & Contemporary) may be more comfortable in ' found' or nonconventional spaces. In this respect dance venues range from the elegant proscenium house, to the church basement to the shopping mall.



#### 2.) DANCE LIGHTING - TECHNIQUES

Theatre lighting is concerned with lighting the actor' s face for visibility. Dance lighting is concerned with lighting the human form for plasticity, interest and emotional impact first and visibility of the face, second. In theatre, front light usually provides the main lighting to the acting areas. In dance however, side lighting is usually a main source of illumination. Front lighting, if used at all is usually reserved for the provision of color washes or specials.

Side light was introduced to dance by Jean Rosenthal a famous American lighting designer in the early 1940' s. "My system required fixed lighting booms along the side at every entrance as a basis for flexibility and for lighting the whole stage. That made the ballets look different, which roused the European choreographers and designers for Ballet International in 1944". (Rosenthal, The Magic of Light). Ms. Rosenthal also worked with the well known American choreographer, Martha Graham, for many years.

In addition to the extensive use of side light, dance lighting often uses ' down lights' (pools), and

' back lights' (to silhouette dancer). Front light is seldom used due to its ' flattening' characteristic and this position is usually reserved for ' color wash' lighting. The followspot is often used in Ballet to highlight the principal dancers.

Side lighting techniques, usually require a vertical lighting boom in each ' leg' or entrance. Often 64 booms may be required (each side). Each boom may have one (1) or more fixtures (usually 3-5). The fixtures (usually ellipsoidals) are focused straight across the stage, and usually ' shutter' off, of the opposite side, stage masking.

A typical three (3) fixture boom, might have fixtures mounted at 10' , 8' and 1 ft., above the floor. The fixtures are often referred to as being in a TOP, MID or SHIN positions. The TOP and MID fixtures are usually used for general side light. Often the TOPS and MIDS will have different colored filters. The bottom lamp (shin or shin buster) has been traditionally used to light the legs of the ballet dancer, and to provide light up, under the tutu. Modern dance designers may use the shins as the principal source for a non naturalistic angle of light, often with strong color(s). If properly shuttered off of the floor the effect can cause the dancer to appear to ' float' across the floor. The effect is very dramatic, particularly with opposing colors from opposite sides.

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### 3.04 - OPERA LIGHTING DESIGN

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#### 1.) OPERA LIGHTING

Lighting for opera used to refer to traditional ' grand opera' , however, today it may also refer to contemporary opera. As such, opera may be performed in the grandest of concert halls, or in the least elegant of hockey arenas. Opera is about music, theatre, singing, acting and dance, and as such lighting design for opera is typically a combination of theater, dance and musical theatre lighting techniques. Fortunately for the lighting designer, and due to the need for good acoustics, most professional operas take place in well designed theatres or concert halls.



#### 2.) OPERA LIGHTING - TECHNIQUES

Opera lighting must light the singers for clarity, the dancers and chorus for interest and the scenery for atmosphere. Operas may be simplistic and straight forward, or highly complex and stylized. It is not unusual for ' visions' to appear from out of ' nowhere' . Nor is it unusual to have the ' devil' frequently appear or disappear throughout the course of the production. The opera lighting designer must be ready for this and for much more.

The ' scale' of opera lighting can often exceed that of theatre, dance or musical theatre lighting. Typically, opera will use a great deal performance space. The stage is usually large, the lighting positions are usually at a ' high trim' of 235' and there is usually a large amount of scenery to light.

To further complicate matters, the opera designer must work quickly. Generally there is less time to ' light' an opera than there is for a typical stage musical, theatre or dance production. Professional performers and union crews are expensive (and plentiful) and the opera lighting designer will often have only one or two lighting rehearsals, prior to the opening of the production.

Most opera singers are like moths and they tend to gravitate towards the light. They seldom miss

their specials and if they do they are very good at ' finding their light' very quickly. This designer has also learned that no matter how the director may block an opera, most opera stars will end up downstage center - in front of the conductor, most of the time.

Next to the opera director, it is the Maestro (conductor) that runs the show. The conductor is a very important member of the artistic team and is concerned with how the singers and musicians sound together. During a performance it is considered appropriate to spotlight the Maestro upon entering the orchestra pit. Further it is mandatory that the singers and musicians, all are able to clearly see the maestros' hands at all times. In this respect a downlight is usually used from above, to light the maestro' s body, arms and hands.

It is generally assumed that an opera lighting designer is familiar with the music and the opera that they are lighting, unless of course it is a new original opera. Knowledge of opera is mandatory and often must be assumed when a designer is hired. If the designer does not know the opera, he has a tremendous opportunity to take the score and a recording (CD, Video, etc.) and become familiar with it before he even attends his first rehearsal. The score and the recording will provide a valuable aid to: scene breakdown, mood & atmosphere, blocking and general ' lighting looks' .

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### 3.05 - MUSICAL THEATRE LIGHTING DESIGN

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#### 1.) MUSICAL THEATRE LIGHTING

Lighting the "Musical", typically refers to lighting the large scale musical theatre productions (all Broadway or the West End). Classic productions include: ' Hello Dolly' , ' My Fair Lady' , ' The King and I' , ' Oklahoma' , ' Showboat' , ' Guys & Dolls' , ' Music' , Annie, etc. More contemporary musicals include; ' The Lion King' , ' Phantom of the Opera' , ' Cats' , and many more.



The typical musical contains elements of drama, singing, dance and music. A small musical may only have a cast of 4 performers and 2 musicians. A large musical may have a cast of 50-100, actors and dancers and 50 musicians. The musical ' moves' quickly and usually has a great many different scenes and locations.

The usual musical theatre production takes place in a proscenium type of theatre, with the orchestra located in the orchestra pit. Usually the theatre is never quite large enough to accommodate the full amount of scenery, lighting, performers and musicians, necessary.

The musical is often structured with alternate scenes, played downstage of one of several different backdrops. This allows a full scene to be ' preset' upstage. When the drop rises, we are magically transported to a new stage setting.

#### 2.) MUSICAL THEATRE LIGHTING - TECHNIQUES

Most ' classic' musicals strive for realism. That is, many of the scenes are lavishly designed as realistic and believable interiors or exteriors. In this respect, the lighting is expected to provide a specific mood, atmosphere and indication of time of day. Often this information is also provided by the lyrics and by the script.

In addition to the element of realism expected by the audience, musicals also contain elements of

fantasy and surprise. It not uncommon during a song, to completely isolate performers with follow spots, and then suddenly ' restore to reality' at the end of the song. Other numbers may be full production numbers, with full chorus and dancers requiring colorful and rapid lighting changes throughout.

Typically, musicals make extensive use of followspots. This is necessary if the performer is to be isolated during musical numbers, and featured during ' book' scenes. Two (2) to five (5) followspot are typically used, from the ceiling of the auditorium. Followspots are also sometimes used from behind the proscenium arch (bridge spot) to provide a steeper & more isolated lighting angle to the stage.

Lighting techniques for the musical are varied. Visibility is usually provided for by the followspots. ' Area lighting' is often provided for the ' book scenes' , color; washes, sidelight and back light are usually provided for the production and dance numbers. The backdrops and cyclorama are illuminated for interest and mood. Musicals often have a high level of ' glitz' (or effect) lighting. Strobes, neon, beacons, tracking bulbs, mirror balls, etc. are all commonplace.

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### 3.06 - CONCERT LIGHTING DESIGN

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#### 1.) CONCERT LIGHTING

It was in the 1960' s that the relatively new field of concert (or entertainment) lighting design was born. In New York at the Filmore East and in California at the Filmore West, popular music moved into permanent venues and with that, a new style of presentation was born. the best known American concert lighting designers of the time was Chip Monk. At the Filmore, lighting operation literally consisted of the operator actually ' dancing' on a wall of autotransformer dimmers in time with the music.



Many early performances at the Filmore' s, the Electric Circus and elsewhere throughout America, were backed by a ' light show' . A wide array of projection effects would bombard a large rear scree behind the performers, causing dynamic and ever changing patterns of light. Projections would often make political statements, be downright dirty or be totally psychedelic and far out.

Today concert lighting design has become a recognized speciality and many designers work in this field only. The basic principals of design still apply -it' s just that the toys are bigger, and more expensive.

#### 2.) CONCERT LIGHTING - TECHNIQUES

Entertainment lighting today has become tremendously exciting. This industry now uses ' automated lighting fixtures almost exclusively. Conventional lighting fixtures are still used, however less and less often. The PAR 64 fixture is still very popular for concert lighting, as this fixture is efficient and relatively inexpensive. It is not uncommon to also incorporate; color changers, motion effects, image and background projection, video, display panels, strobes, blacklight, fog, pyro, chase lighting and other visual effects. The sky' s the limit...uh...the budget' s the limit.

Typically all equipment is DMX controlled from a central location. Concert lighting that uses automated fixtures depends very much on two important people - the Lighting Designer and the

Programmer. The position of ' programmer' was born in the 1980' s as automated fixtures became more and more capable (and complicated). A good programmer will know his equipment well and will be able to rapidly construct a number of different ' looks' , based on the designer' s basic criteria. A poor programmer offers little and is able to make a million dollars of equipment look like ten cents! Alternately a good programmer can produce amazing results with very little time and equipment.

Most concert performers also tour, so concert lighting must be extremely durable, well packaged, and suited to a rapid set-up and take-down. The portable ' flown' lighting truss was developed for the industry and is often used to suspend all lighting fixtures above the stage.

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### 3.07 - ARENA LIGHTING DESIGN

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#### 1.) ARENA LIGHTING

Lighting for the "Arena" typically refers to lighting of large scale events, including rock shows, pageants, ice shows, circuses and other sizable entertainment productions. Seating for these events may range from 5,000 to 25,000 spectators, or more. Often there may be a ' main stage' at one end of the arena, or alternately, several different performance areas, located throughout the entire arena floor.



Performers often include actors, singers, dancers, musicians, skaters, aerial artists and others. Events are often visually spectacular and may utilize smoke, fog, lasers, pyro (fireworks), slide, film or video projection. Further, lighting equipment today always includes as many automated fixtures as the budget will possibly allow.

Two very important factors set arena lighting apart from other forms of traditional stage lighting. First, the ' scale' is much larger than usual theatre scale. This refers to the scale of everything, including performance and audience areas, scenery, lighting distances and lighting fixture types. Second, everything is temporary. Typically, all special lighting equipment must be brought into the arena, hung, cabled and focused, and then removed (struck) after the event. Arena lighting should be designed to be ' quick and effective' (not necessarily ' quick and dirty' ).

#### 2.) ARENA LIGHTING - TECHNIQUES

Distances to the overhead lighting in conventional theatres usually ranges from 20-50 feet. In arenas, lighting distances may range from 40-100 feet, or more. The greater distances alone, necessitate the use of narrower and more powerful lighting fixtures than used for traditional theatre lighting.

Usually, all lighting equipment is hung (usually pre-hung & cabled) on a number of lighting trusses (20-60 feet long). Trusses are assembled, laid out in position on the arena floor, and then hoisted into position with chain motors, attached to the steel roof members above. Trained lighting crews will either repel from the roof or climb a rope (wire) ladder from the floor to reach each truss. Once in place, they will carefully walk along the truss and focus each fixture one by one. The author has had a skilled crew of four (4) electricians focus over 300 units, 50 feet above the floor, in under four (4) hours).

Lighting fixtures suitable for arena applications include the 1Kw. narrow ellipsoidals (5-20 degrees), Par64-NSP fixtures, and 2Kw. ellipsoidals, fresnels, and beam projectors. HID fixtures with

mechanical dimmers are also sometimes used. Effects equipment commonly includes color scrollers and automated (moving) fixtures. The followspot is typically used in great numbers for arena events. Usually, the followspots ' come with the house' and are located high in the arena ceiling around the perimeter walls. Most facilities have from four 4 - 8 units or more. Some touring productions in order to provide consistency from venue to venue, provide their own followspots, mounted in the temporary overhead lighting trusses.

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### 3.08 - OUTDOOR LIGHTING DESIGN

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#### 1.) OUTDOOR LIGHTING

Lighting for the outdoor stage includes both open air or semi-enclosed facilities. Productions may include dramas, pageants, , operas, dance, concerts, rock shows, ceremonies, parades, and other variety or theatrical events. The outdoor facility may vary from an open field, to a semi-enclosed stadium, to a special facility constructed for theatre or music. Often the stage is enclosed or covered and the audience is not. Sometimes just the reverse is true.



Many outdoor facilities are orientated so that the sun illuminates the stage, from behind the audience. This usually promotes maximum visibility and usually keeps the direct vision of the sun from the audience. More sophisticated facilities will enclosed the stage with a ' stagehouse' , some offering full ' flying' facilities. Often outdoor events are ' timed' to begin in the evening before sun and end in the dark of night.

The one fundamental concept that the lighting designer working on an outdoor stage must learn is: IT ISN' T EASY TO COMPETE WITH MOTHER NATURE. Stage lighting during a bright sunny day is almost impossible and has no impact. Stage lighting during a cloudy or overcast day may have some impact but usually at best provides basic illumination. During the day, the designer may need to provide 100' s of kilowatts of lighting to a provide even a minor impression on a stage. The lighting may only tend to fill in the shadows at best. If suddenly a cloud passes over the sun, the stage lighting levels will seem to rise drastically. Once the sun has started to set however, a fixture of just 1 kilowatt can appear brighter to the audience than the 100' s of kilowatts previously required to provide the same visual impression.

I regularly design the lighting at Canada' s largest outdoor professional musical theatre Rainbow Stage (stage is enclosed). The facility is located in one of Winnipeg' s largest and nicest parks, not far from the city centre. The 2500 seat facility is semi-enclosed under a 200 foot diameter geodesic dome, with a view of the trees, below. Act 1 usually starts at 8:00 pm and requires almost all lighting to be at FULL due to the high ambient daylight levels in the auditorium - and the lighting is hardly even noticeable. Slowly - but steadily as the sun starts to set, the lighting becomes more and more noticeable. It is necessary to make constant adjustments to compensate for the darkening ambient daylight. By the time the sun has set, much less light is required to give the same impression as was needed, minutes earlier.

Outdoor events usually involve large venues with large audiences. In this respect the most powerful and efficient stage lighting fixtures are used. The 1000 watt Par64 fixture is one popular choice for outdoor lighting applications, due to its compact size, low weight and high efficiency. H.I.D. (high intensity discharge) fixtures are also used, with automated color changers and mechanical dimmers. High power followspots are also quite common for o outdoor events.



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### 3.09 - DISPLAY LIGHTING DESIGN

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#### 1.) DISPLAY LIGHTING

Display lighting includes all lighting for commercial merchandising, including lighting for store windows and for in-store displays. This discipline is discussed here because there are probably more individuals practicing display lighting than stage lighting - it's just that most of them don't know it.

The display lighting designer is usually not a lighting designer at all, simply the person that 'does the lights'. In this respect training, goals and approaches vary drastically. Display lighting is often performed by the 'Display Department' of large department stores or by individual members of the merchandising team, and in this respect there are no particular standards.



The world of display lighting and stage lighting are both totally dissimilar yet quite similar. They are dissimilar in that the stage and display lighting designer seldom if ever communicate with each other. Stage display lighting and stage lighting are similar however in that most of the objectives and methods are the same. The only fundamental difference is in the smaller scale and lower wattage fixtures, frequently encountered in the display lighting field.

The goals are similar to the goals of stage lighting in that display lighting must create visibility, mood, interest, and impact and it must communicate something - even if the concept is to Sell!.

#### 2.) DISPLAY LIGHTING - TECHNIQUES

Typical display lighting distances vary from 6-20 feet - short in comparison to distances encountered in stage lighting applications. For this reason display lighting typically makes use of comparatively wide angle fixtures.

Display lighting fixtures are generally smaller and more compact than their theatre counterparts. Typical display fixtures include the 3.5" ellipsoidal reflector, the 3" fresnel and a wide range of speciality display fixtures. Specialty display fixtures consist of both line voltage (120/240) and low voltage 'R' (reflector) and 'Par' (parabolic aluminized reflector) lamps, mounted in small housing. Pin Spots are also quite common. Typical wattages of display lighting fixtures range from about 100-300 watts.

Often 'track lighting' is used for general window display and in-store display lighting. A variety of different fixture types are available that simply 'clip' to the track, so the lighting may be rapidly changed as the display changes. Make sure that whichever fixtures are used that they allow the use of an accessory color filter. Most do not.

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### 3.10 - TELEVISION (TV) & VIDEO LIGHTING

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#### 1.) TELEVISION LIGHTING

Lighting for television includes commercial and



closed circuit television and professional video productions - either broadcast live or recorded. TV lighting design methods were ultimately born from the practice of stage and still photography lighting. Today it is estimated that throughout the world there are actually more designers working in the field of video and TV lighting, than any other lighting discipline. The TV designer is known as the LIGHTING DIRECTOR.

Both television and stage lighting design can be considered as an art form, at least when in the right hands. While the stage designer is most concerned with how the eye of the audience reacts to light, the television lighting designer is more concerned with how the TV camera responds to light.

In the early days of television, it was not uncommon for the first black and white cameras to require in the neighborhood of 250 foot candles or more. When color cameras were introduced, even more light was typically required. During the past several decades, the amount of light required for good picture signal has steadily decreased, as television camera technology has improved. Today it is not uncommon for state-of-the art color cameras to require less than 50 f.c.

The television lighting designer is not just concerned with the quantity of light (footcandles), he is also concerned with the quality of light, just as is the stage lighting designer.

The TV designer is also concerned with color temperature and contrast (contrast between the performer and the surrounding set or background). In fact, the TV designer is much more concerned with contrast, or specifically differences in contrast, everywhere throughout the picture area. This is due to the fact that the TV camera tolerates much less of a contrast range than does the human eye. Although the human eye can adjust to contrast in the field of vision in the order of 100,000:1, the TV camera can only handle a contrast range of 100:1, at the best.

Television lighting techniques also should provide a degree of interest or visual balance to the picture. Typically, TV designers will provide a strong directional KEY LIGHT to a performer from one side and a softer, less intense FILL LIGHT, at an angle of approximately 90 degrees to the KEY light. Next, a BACK light is usually used to help visually separate the performer from the background. As in theatre, once the performer is lighted for visibility (or proper signal, in TV), the background and surrounding scenery is illuminated for visual balance, (BASE LIGHT).

TV lighting fixtures resemble theatre fixtures except they are generally larger and of higher wattage. The 2, 5 and 10 Kw FRESNEL is commonly used for key, and back lighting. Other fixtures include SCOOPS and FLOODS are often used for fill and background lighting. Most TV fixtures are designed to be focused and adjusted from the studio floor using a ' long pole' .

### 3.11 - PHOTO and PHOTOGRAPHIC LIGHTING

#### 1.) PHOTOGRAPHIC LIGHTING

Lighting for still photography is just as much of an art form as is stage lighting design. Generally however, there is no such thing as a ' photographic' lighting designer. Photographers usually do their own lighting and as such, they are responsible for all artistic elements of the image, including; light, contrast, balance, composition, style, impression, mood, etc.



The professional photographer must know the

properties of his film in respect to proper exposure, saturation and contrast. Although the human eye can adjust to a wide range of ' brightness' all at once in the visual field, the camera and film cannot. Contrast must be limited to perhaps no more than 3:1 for some films.

Sometimes the stage lighting designer will be present during a production to work with a still photographer, taking documentary or public relations shots of a production. The designer can assist the photographer by ensuring that there is interesting light where needed. Also, background scenery and cycloramas that appear adequately illuminated to the eye, may appear dark, dingy and underexposed to the film. Add additional lighting to these elements as required to reduce subject to background contrast.

Typically theatre photographers will use a ' high speed' , Black and white or color film. Positive transparencies (slides) are still preferred by most professional photographers, over a color print film, due to their higher color saturation and due to the fact that they ' reproduce' better than do prints, for most applications.

## 2.) PHOTOGRAPHIC LIGHTING - TECHNIQUES

Natural light and studio lighting are both commonly used for photographic lighting applications. Good studio lighting is often loosely based on the principals of McCandless. Two lights are placed at 45 degrees to each other, in front of the subject. Often one light is brighter (KEY LIGHT) and is used to provide a sense of direction and motivation. The other light (FILL LIGHT), is of slightly lower intensity and ' softer' , and is used to fill in shadows caused by the main light. Often ' back' lighting to the subject is provided to help isolate the subject from the background. Additional lighting is then provided to the background as needed.

There are many photographic lighting techniques shown in many photography books. One of my favorite techniques however, is as follows: To photograph a very large room, (church, auditorium, etc.) with poor lighting do the following: Select a film speed and exposure that will allow a 3-5 minute exposure. Then, open the lens and walk throughout the room with a 1000 watt flood light, evenly painting all surfaces. All surfaces in the photo will be properly exposed, and the ' light painter' will be invisible if he moves quickly enough. Simply paint more light where darker surfaces or additional detail is required. Some experimentation with this process is required.

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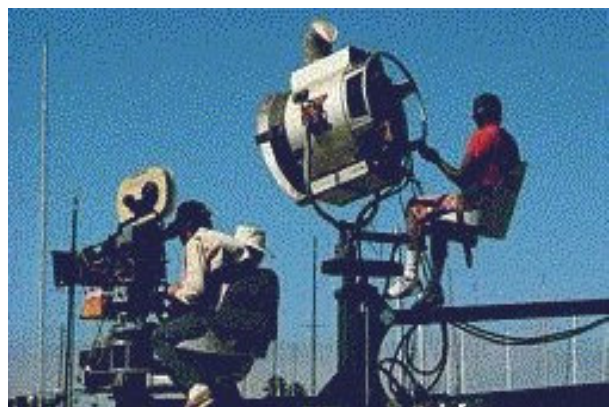
## 3.12 - FILM and MOTION PICTURE LIGHTING

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### 1.) FILM LIGHTING

Lighting for film is an art form within itself. Witness only, many of the fine (and not so fine) films produced during the past decades. In addition, film is a wonderful and valuable medium to capture and then study lighting and lighting techniques.

Lighting for film is a marriage between the cameraman, his film and the processing lab. Film lighting techniques are heavily dependent on the knowledge of how a particular film stock will react to a particular type of light - in respect to; intensity, contrast and color temperature. A multitude of image qualities are available by manipulating; exposure, color temperature and film processing.



### 2.) FILM LIGHTING - TECHNIQUES

Both daylight and artificial sources are commonly used for film lighting.

Lighting fixtures for the film industry are similar to stage lighting fixtures, except, they are larger and of higher wattage. Although incandescent fixtures are still used, many new fixtures using H.I.D. (high intensity discharge) sources, are now also commonly used.

The fresnel, open face flood (broad) and the ' 9 light' are all popular film lighting fixtures. The ' 9 light' unit, consists of 9 Par lamps mounted in a 3 x 3 matrix. This provides a ' large source size' , and is excellent for ' key' or motivational lighting.

Color temperature and color balance is very important in film. Often the sources will be balanced using color correction filters, either over each individual fixture, or on the camera lens itself.

Film lighting makes extensive use of reflectors (with various different types of surfaces) to bounce and reflect light and to ' fill' in the shadows.

Fixtures are usually mounted overhead, on stands or on trucks. When ' on location' large generator and ' miles' of cable are often used to power the fixtures.

### 3.13 - MUSEUM AND ART GALLERY LIGHTING

#### 1.) MUSEUM / GALLERY LIGHTING

Lighting for museums and galleries always presents a challenge. Often this work is undertaken by the museum staff themselves. At other times a stage lighting designer or other lighting specialist might be engaged to provide assistance.

The lighting of objects of art must be approached with care. It is well known that the harmful effects from both infrared and ultraviolet radiation can permanently damage almost any object, depending on the degree of exposure.



Although the museum or gallery lighting designer might want to light for interest and visibility, his first concern must be for the preservation of precious objects and artifacts. In this respect the curatorial staff of the museum or gallery will often impose very strict lighting limitations for each item or room.

There are few standards even today indicating what levels of exposure to infrared and ultraviolet is safe for delicate or precious objects. Many curators seem to suggest none. Other studies allow varying levels of light (footcandles or lux) based on the object' s material, construction, condition and rarity - vs the specific properties of the light source to be used. Needless to say, the lighting of precious artifacts must be considered very carefully.

We do know that the harmful effects of ultraviolet and infrared radiation are accumulative. That is, the longer the exposure (time) the greater the damage will be.

Where natural lighting is involved, no direct sunlight should fall on delicate items, including paintings, drawings, printed graphics, tapestries, etc. These items can be damaged by heat (IR) and bleached by the ultraviolet. Hi levels of indirect natural light should generally also be avoided except

on more robust and durable items. Where necessary to limit the harmful effects from an artificial lighting system, the designer must first chose a source that is low in both IR and UV radiation. Incandescent sources are typically the source of choice. The beam of many conventional display lighting fixtures however, often have a hot beam that can easily be detected with one' s hand at a distance of several feet. This is particularly true of some narrow angle PAR, R and MR type lamps. Heat to an object can be limited by increasing the lighting distance with a corresponding loss of light). Alternately, special dichroic lamps can be used that remove the IR component from the light beam by passing this radiation through the reflector towards the back of the lamp.

Ultraviolet radiation from incandescent fixtures is seldom a problem as what little UV exists is ' filtered out' of the light beam by the lamps' clear lens. Some tungsten halogen sources may produce higher (and objectionable) levels of UV however these sources can be filtered with a UV blocking filter available from most theatrical supply houses.

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### 3.14 - ARCHITECTURAL LIGHTING DESIGN

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#### 1.) ARCHITECTURAL LIGHTING

Indirectly related to stage lighting design, architectural lighting design is a relatively new field, becoming popular in the 1970' s. Architectural lighting design refers to the planned lighting of both interior and exterior spaces. See also: Landscape Lighting.

Typically, for most buildings (commercial and industrial) ' illumination' is prescribed by the ELECTRICAL ENGINEER. This consultant is usually responsible for; general electrical systems, power distribution, audio systems, fire alarm systems and lighting. Occasionally, an ILLUMINATING ENGINEER may specify the lighting. Typically when these engineers specify a lighting system, they are most concerned with providing proper illumination - for specific work related tasks.



The LIGHTING DESIGNER is a fairly new addition to the architectural team. Although usually not an engineer, this consultant will often specify all lighting and illumination criteria. He will work directly with the other consultants (architectural, structural, mechanical and electrical) to ensure that the lighting systems are properly designed, detailed and drawn.

Architectural lighting is far more than illumination however. The architectural lighting designer may be concerned with properly lighting buildings and spaces. He may be concerned with lighting levels, lighting efficiency and lighting safety. The architectural lighting designer however should also be very much concerned with the performance and well being of a human being, in an architectural space. Good lighting design always works towards solving specific criteria. Architectural lighting may provide basic ' seeability' for specific tasks, or may assist in effect, esthetics, comfort, health, safety and well being.

The architectural lighting designer must have a complete understanding of both the physics of light and the psychological effects of light. He must be well versed with the architectural design and construction process and must be able to design responsibly within budgets.

#### 2.) ARCHITECTURAL LIGHTING - TECHNIQUES

There are many hundreds of manufacturers around the world that specialize in the manufacture of architectural lighting fixtures. Fixtures come in all grades, shapes and sizes. Literally, thousands of different fixtures exist, for different application. Fixtures may use incandescent, fluorescent or high intensity discharge sources. H.I.D. sources are generally used where possible as they are highly efficient and have lamps with extremely long life.

Stage lighting fixtures are seldom used for architectural lighting. Stage fixtures use ' photo' type lamps with relatively low hours, and fixtures are generally not designed for continuous operation.

Architectural lighting (as does stage lighting) uses a combination of flood and spotlight techniques. Fixtures are typically positioned as down lights, however some applications may require uplighting or side lighting for dramatic effect.

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### 3.15 LANDSCAPE LIGHTING DESIGN

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#### 1.) LANDSCAPE LIGHTING

The art of landscape lighting usually merges with the field of architectural lighting design. The field of landscape lighting also goes hand in hand with the relatively new architectural specialty, the landscape architect.

The landscape lighting designer is responsible for large outdoor (usually) lighting designs consisting mainly of flora and foliage. Often the lighting design includes, trees, pools, bridges, paths, fountains, sculptures, benches, rest areas and much more.



The landscape lighting designer has similar goals to other lighting designers. He is often lighting for visibility, mood, atmosphere and interest, just as does the stage lighting designer for a dramatic presentation. The landscape lighting designer also usually has an additional concern in that he often must light for safety first and atmosphere and impact second.

#### 2.) LANDSCAPE LIGHTING - TECHNIQUES

Most landscape lighting makes use of miniature low voltage lighting fixtures. A low voltage system is mandatory to ensure greater safety and to reduce risk from electrical shock, as the fixtures and wiring are often operated under wet conditions.

Fixtures are typically located at ground level to uplight plants and shrubs or may be placed on trees to uplight (or downlight) the trunks. Other landscape lighting fixtures include the use of illuminated bollards. These post like fixtures come in a wide variety of types and are typically used to illuminate paths, foliage or other exterior areas. Decorative lampposts, available in an unlimited number of designs are also commonly used.

Usually landscape lighting is placed on a control system that turns the system ' on' or ' off' at specific times. Alternately a system might use a photocell control, turning the system on at dusk and off at dawn.

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[Stage Lighting Design](#)

