Theatre Production

Backstage Life

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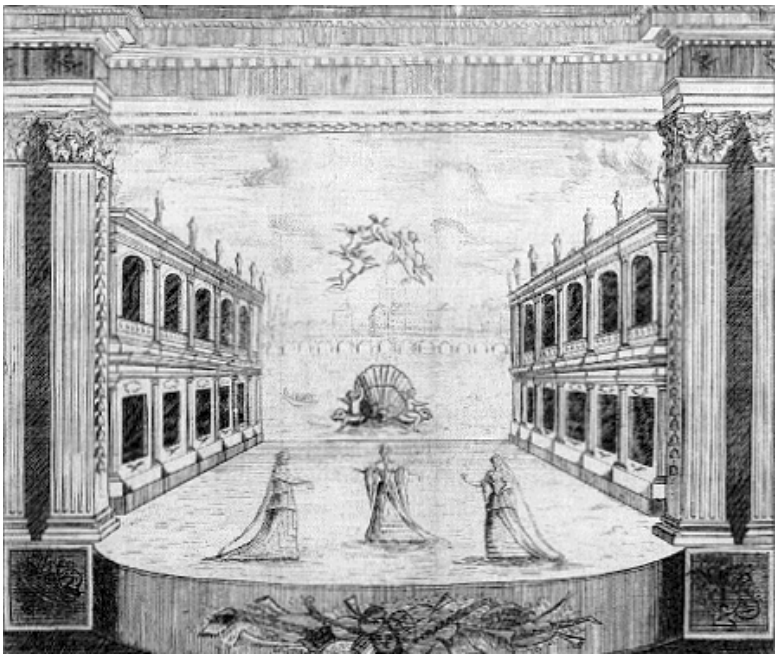
Stage (theatre)

In theatre, the **stage** (sometimes referred to as the **deck** in stagecraft) is a designated space for the performance of theatrical productions. The stage serves as a space for actors or performers and a focal point for the members of the audience. As an architectural feature, the stage may consist of a platform (often raised) or series of platforms. In some cases, these may be temporary or adjustable but in theaters and other buildings devoted to such productions, the stage is often a permanent feature.



Actors performing on the stage of the Drury Lane Theatre, 1674.

There are several types of stages that vary as to the usage and the relation of the audience to them.[1] The most common form found in the West is the proscenium stage. In this type, the audience is located on one side of the stage with the remaining sides hidden and used by the performers and technicians. Thrust stages may be similar to proscenium stages but with a platform or performance area that extends into the audience space so that the audience is located on three sides. In theatre in the round, the audience is located on all four sides of the stage. The fourth type of stage incorporates created and found stages which may be constructed specifically for a performance or may involve a space that is adapted as a stage.

Stage in Polish Theatre in Bielsko-Biała.

Types of staging

Proscenium stage

Since the Italian Renaissance, the most common stage used in the West has been the proscenium stage which may also be referred to as a *picture frame stage*. The primary feature is a large opening known as the proscenium arch through which the audience views the performance. The audience directly faces the stage—which is typically raised several feet above front row audience

level—and views only one side of the scene. This one side is commonly known as the invisible *fourth wall* of the scene. The proscenium arch evolved from the *proskenium* in Ancient Greek theatres. This was the space in front of the *skênê* or backdrop where the actors actually played.

The first indoor theatres were created in French tennis courts and Italian Renaissance palaces where the newly-embraced principles of perspective allowed designers to create stunning vistas with buildings and trees decreasing in size toward a "vanishing point" on the horizon. Stage floors were raked upward slightly from front to back in order to contribute to the perspective illusion and also to make actors more visible to audiences, who were seated on level floors. Subsequently, audience seating was raked, and balconies were added to give audiences a fuller view. By the end of the 19th century most stages had level floors, and much of the audience looked down on, rather than up to, the stage.

The competition among royals to produce elegant and elaborate entertainments fueled and financed the expansion of European court theatres. The proscenium—which often was extremely decorative in the manner of a triumphal arch—"framed" the prospective picture. The desire of court painters to show more than one of their perspective backgrounds led court architects to adapt the pin-rails and pulleys of sailing ships to the unrolling, and later to the lowering and raising, of canvas backdrops. A wood (and later steel) *grid* above the stage supported pulleys from which wooden battens, and later steel pipes, rolled down, or descended, with attached scenery pieces. The weight of heavy pieces was counterbalanced by sandbags. This system required the creation of a storage *stage house* or *loft* that was usually as high or higher than the proscenium itself. A "full-fly" stage could store the entire height of scenery above the visible stage using the pin-rails before or during performance, whereas a "half-fly" stage (common in smaller locations) could only store props of limited size and thus required more careful backdrop and scenery design. Theatres using these rope systems, which are manually operated by stage hands, are known as *hemp houses*. They have been largely supplanted by counterweight fly systems.

The proscenium, in conjunction with stage curtains called *legs*, conceals the sides of the stage, which are known as the *wings*. The wings may be used by theatre personnel during performances and as storage spaces for scenery and theatrical properties. Several rows of short curtains across the top of the stage, called *teasers,* hide the backdrops, which in turn are hidden above the stage in the fly system loft until ready for use.

Often, a stage may extend in front of the proscenium arch which offers additional playing area to the actors. This area is a referred to as the apron. Underneath and in front of the apron is sometimes an orchestra pit which is used by musicians during musicals and operas. The orchestra pit may sometimes be covered and used as an additional playing space in order to bring the actors closer to the audience. The stage is often raised higher than the audience. Space above some proscenium stages may include a flyloft where curtains, scenery, and battens supporting a variety of lighting instruments may hang.

A mentalist on a stage apron in a mind-reading performance, 1900

The numerous advantages of the proscenium stage have led to its popularity in the West. Many theatrical properties and scenery may be utilized. Backdrops, curtains and lighting can be used to greater effect without risk of rigging being visible to the audience. Entrances and exits can be made more graceful; surprise becomes possible. The actors only have to concentrate on playing to the audience in one direction.

Boxes are a feature of more modern stage designs in which temporary walls are built inside any proscenium stage, at a slight angle to the original walls, in order to allow audience members located to the left or right of the proscenium (the further out, the larger the angle) to see the entirety of the stage. They enable the creation of rat runs around the back of the stage, which allow cast members to walk between entrances and exits without being seen by the audience.

Theatre in the round

This method of stage design consists of a stage situated in the centre of the theatre, with the audience facing it from all sides. The audience is placed quite close to the action which provokes a feeling of intimacy and involvement.

In-the-round stages require special considerations in production such as:

- Scenery that does not obscure actors and the rest of the stage from parts of the audience.
- Backdrops and curtains cannot be used, thus the director must find other ways to set the scene.
- Lighting design is more difficult than for a Proscenium stage, since the actor must be lit from all sides without blinding nearby audience members.
- Entrances and exits must be made either through the audience, making surprise entrances very difficult, or via closed-off walkways, which must be inconspicuous. As a result, stage entrances are normally in the corners of the theatre.
- The actors need to ensure that they do not have their backs turned to any part of the audience for long periods of time, in order to be seen and heard clearly.

Thrust stage

A thrust stage is one that extends into the audience on three sides and is connected to the backstage area by its up stage end. A thrust has the benefit of greater intimacy between the audience and performers than a proscenium, while retaining the utility of a backstage area. Entrances onto a thrust are most readily made from backstage, although some theatres provide for performers to enter through the audience using vomitory entrances. An arena, exposed on all sides to the audience, is without a backstage and relies entirely on entrances in the house or from under the stage.

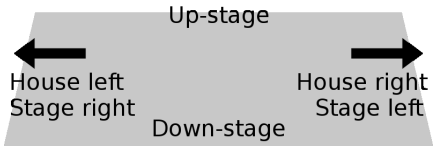
The thrust stage of the Elizabethan-style theatre at the Oregon Shakespeare Festival

As with an arena, the audience in a thrust stage theatre may view the stage from three or more sides. If a performance employs the fourth wall, that imaginary wall must be maintained on multiple sides. Because the audience can view the performance from a variety of perspectives, it is usual for the blocking, props and scenery to receive thorough consideration to ensure that no perspective is blocked from view. A high backed chair, for instance, when placed stage-right, could create a blind spot in the stage left action.

Created and found spaces

A stage can also be improvised where ever a suitable space can be found. Examples may include staging a performance in a non traditional space such as a basement of a building, a side of a hill or, in the case of a busking troupe, the street. In a similar manner, a makeshift stage can be created by modifying an environment. For example demarcating the boundaries of a stage in an open space by laying a carpet and arranging seating before it.

Stage terminology



House right/left are from the audience's perspective

The stage itself has been given named areas to facilitate the precise movement and positioning of actors on a stage (see Blocking (stage)).

To an actor facing the audience, "left" and "right" are the reverse of what they are for the audience. To prevent confusion, actors and directors never use the unmarked terms *left* or *right* for the sides of the stage. Rather, they use a phrase specifying the viewpoint. The terms "stage left" and "stage right", respectively, denote the sides of the stage that are on the actor's left and right when the actor is facing the audience, while "house left" and "house right" are the reverse, denoting the sides of the stage as viewed by the audience.

Likewise, the meaning of "front" and "back" would be unclear because they depend on perspective. Instead, the term "upstage" is used to denote the part of the stage furthest from the audience or to motion away from the audience, while "downstage" denotes the portion of the stage closest to the audience or to motion in that direction. These terms were common in older theatres due to the elevation of the actual stage deck. Older theatre designs offered the audience a better view of the action by inclining the floor (known as a raked stage), so upstage was actually a higher elevation than downstage.

A raked stage can vary in its incline; the optimal incline is ten degrees, which is ideal for the audience and actor comfort. A dancing surface incline is often different from an acting incline and can vary from three degrees to twenty degrees.

References

[1] http://www.ia470.com/primer/theatres.htm

Stagecraft

Stagecraft is a generic term referring to the technical aspects of theatrical, film, and video production. It includes, but is not limited to, constructing and rigging scenery, hanging and focusing of lighting, design and procurement of costumes, makeup, procurement of props, stage management, and recording and mixing of sound. Stagecraft is distinct from the wider umbrella term of scenography. Considered a technical rather than an artistic field, it relates primarily to the practical implementation of a designer's artistic vision.

Early stagecraft master Robert Edmond Jones (1887-1954) drawing at a waist high table (c. 1920).

In its most basic form, stagecraft is managed by a single person (often the stage manager of a smaller production) who arranges all scenery, costumes, lighting, and sound, and organizes the cast. At a more professional level, for example modern Broadway houses, stagecraft is managed by hundreds of skilled carpenters, painters, electricians, stagehands, stitchers, wigmakers, and the like. This modern form of stagecraft is highly technical and specialized: it comprises many sub-disciplines and a vast trove of history and tradition.

The majority of stagecraft lies between these two extremes. Regional theatres and larger community theatres will generally have a technical director and a complement of designers, each of whom has a direct hand in their respective designs.

History

The first document of stagecraft was medieval drama dating back to 1452. Plays were held in different places such as the streets of towns and cities. Some were also held in monasteries. The playing place could represent many different things such as indoors or outdoors. They were played in certain places so the props could be used for the play. Songs and spectacles were often used in plays to enhance participation.[1]

The next known major act of stagecraft was in England where they performed renaissance drama from 1576-1642. This was the birth place of the first licensed theater in London but not long after they were closed because of an outbreak of civil war. There were three different types of theaters in London - public, private and court. The size and shape varied but many were suggested to be round theaters. It was a penny admission to stand in the pit. Prices increase for seating. Court plays were used for holidays and special occasions. [2]

French and English restoration was the next big step for drama. Stages were taxed to enhance the depth of them. Wings were arranged on each side of the stage to suggest a long perspective on the stages. The back housed a big portrait that set the scene of each play. Many playwrights were reverting back to earlier times with dated scenes and costumes. One king of France built a theater in his palace with French builder. King Charles II granted Thomas Kikigrew the right to form an acting crew and company.

After this era all theaters converted to more modern eras and ways. Theaters were more up to date and were created with better things like fake plants and better props that made the whole experience more worthwhile. New forms of

theater began to emerge such as melodrama, which was a popular singing drama. Next came the well-made play. These two types of plays would prove to stand as the most popular through most of the 19th century. Along with theaters casting, staging received great upgrades and became more proficient. Many new ones were being built. By the middle of the century over 65 permanent theaters had been built in Germany. Most of these had the technology to have rapid scene change.

Sub-disciplines

For a topical guide to this subject, see Outline of Stagecraft.

Stagecraft comprises many disciplines, typically divided into a number of main disciplines:

- **Lighting**: Lighting design, which involves the process of determining the size, intensity, shape, and color of light for a given scene. Hanging, focusing, procurement and maintenance of lighting and special effects equipment, aspects of show control
- **Make-up/Wigs**: The application of makeup and wigs to accentuate an actor's features.
- **Mechanics**: Design, engineering and operation of Flown scenery or flying of performers and mechanised scenic elements and special effects.
- **Production**, comprising stage management, production management, show control, house management and company management
- **Scenery**, which includes set construction, scenic painting, theater drapes and stage curtains, and special effects.
- **Sound**, which can include musical underscoring, vocal and instrument mixing as well as theatrical sound effects.
- **Theatrical property**, or props, which includes furnishings, set dressings, and all items large and small which cannot be classified as scenery, electrics or wardrobe. Some crossover may apply. Props handled by actors are known as hand props, and props which are kept in an actor's costume are known as personal props.
- **Wardrobe**: costume design, construction, procurement and maintenance.
- **Video** (or Projection) is a relatively recent field of stagecraft which is gaining recognition. As well as being a discipline in itself, its role may also be taken on by the Lighting or Scenery disciplines.

References

[1] Cp;dewey,John. Drama Classical to Contemporary. New Jersey: Prentice Hall, 2001.

[2] Styan, John."Shakespeare's Stagecraft." Oct 7 200. 30 Nov 2007 Http://cambridege.org/uk/catalouge.asp?isbn=0521094356

External links

- "Controlbooth.com" (http://www.controlbooth.com) USA based forum geared towards educational and professional technical theatre
- "The Blue Room" (http://www.blue-room.org.uk) UK based forum for the discussion of technical theatre by its practitioners
- "Ukslc.org" (http://www.ukslc.org) Uk Based Sound and Lighting Community, News, Review, Chat and more...
- "Stagecraft" (http://stagecraft.theprices.net) USA based mailing list for the discussion of technical theatre by its practitioners.
- Handbook on technical theatre (http://www.gweep.net/~prefect/pubs/iqp/technical_theatre_handbook.pdf)
- "Stagelink" (http://www.stagelink.com) Production resources for technical theatre
- Richard Southern Collection at the University of Bristol Theatre Collection (http://www.bris.ac.uk/theatrecollection/richardsouthern.html), University of Bristol
- "Roadie" (http://www.roadie.net) Website for those touring with concerts
- "Rec.arts.theatre.stagecraft" (http://groups.google.com/group/rec.arts.theatre.stagecraft/topics?gvc=2) Usenet group for stagecraft

Stage management

Stage management is the practice of organizing and coordinating a theatrical production. It encompasses a variety of activities, including organizing the production and coordinating communications between various personnel (*e.g.*, between director and backstage crew, or actors and production management). Stage management is a sub-discipline of stagecraft.

Part of a production manager's panel

A **stage manager** is one who has overall responsibility for stage management and the smooth execution of a production. Stage management may be performed by an individual in small productions, while larger productions typically employ a stage management team consisting of a head stage manager and one or more assistant stage managers.

History

Between the Renaissance and the 17th century, actors and playwrights took upon themselves the handling of finances, general directorial duties, and stage management.[1] Stage management first emerged as a distinct roll in the 17th century during Shakespeare's and Molière's time, though it wasn't until the 18th century in England that the term Stage Manager was used. This was the first time a person other than actors and playwright was hired to direct or manage the stage. Over time, with the rise in complexity of theatre due to advances such as mechanized scenery, quick costume changes, and controlled lighting, the stage manager's job was split into two positions—*director* and *stage manager*.[2]

Responsibilities

The responsibilities and duties of stage management vary depending on the setting of a production (*i.e.*, rehearsal or performance) and the type of production (*e.g.*, theatre, dance, music). Most broadly, it is the stage manager's responsibility to ensure that the director's artistic choices are realized in actual performance.

As the lighting, sound, and set change cues are developed, the stage manager records the timing of each as it relates to the script and other aspects of the performance. The stage manager maintains a prompt book, sometimes called "the book" or "the bible," which contains all cues, technical notes, blocking and other information pertinent to the show.

During rehearsals, the stage manager typically serves as an adjunct to the director by recording the blocking and ensuring that cast members stay on script, have the requisite props, and follow the blocking. Stage managers are responsible for helping establish a show's rehearsal schedule and ensuring that rehearsals run on time. The stage manager typically documents each rehearsal in a rehearsal report.

Once the house opens for a performance, the stage manager controls all aspects of the performance by calling the cues for all transitions (this is known as "calling the show") and acting as communications hub for the cast and crew. Large productions may utilize a stage management team in which the manager is responsible for calling the show while other team members operate backstage to ensure actors and crew are ready to perform their duties. After a show opens, the stage manager is also responsible for calling brush-up, put in and understudy rehearsals to make sure that the show's quality is maintained.[3]

The stage manager ensures that lighting and sound cues are acted upon at the right time by issuing verbal *standby* and *prompt* calls. Each cue call begins with the word "standby" to indicate that an action is imminent and, in response, the technician who will perform the action acknowledges readiness to perform the action. At the

appropriate time, the stage manager will prompt immediate execution of the action by saying "go".

Regional differences

United States

In the United States, *Stage Manager* is a generic title that may be applied to anyone who performs stage management functions. On small shows, one person typically performs all of the tasks of stage management and, in such cases, that person is simply referred to as *the stage manager*. In larger shows, there is often a need for two or more stage managers. In such cases the head stage manager is titled Production Stage Manager (commonly abbreviated PSM), and working under the PSM is one or more Assistant Stage Managers (commonly abbreviated ASM). Shows that employ three stage managers have a PSM and two ASMs, though the program credits may list them as *Production Stage Manager* (first or head stage manager), *Stage Manager* (second stage manager), and *Assistant Stage Manager* (third stage manager).[2]

Professional stage managers are represented by the Actors' Equity Association. In addition to performing their typical stage management duties (e.g., maintaining the prompt book and calling performances), Equity stage managers are also required to uphold the union's rules and rights for Equity artists.

Britain

In Britain, the structure of a stage management team depends on the type and size of the production. It can consist of stage manager (overseeing the running of the show), deputy stage manager (commonly called DSM) and assistant stage manager (commonly called ASM). A fringe theatre show may employ one stage manager to carry out the tasks of an entire team, whereas a West End theatre show in London might employ multiple ASMs. Professional stage managers are represented by the British Actors' Equity Association, which also represents performers.

Deputy stage manager

The DSM prompts actors and may also cue technical crew members while following the orders of the director and stage manager. The DSM calls actors to hold while technical problems are sorted out during rehearsal, and determines where in the script to restart halted scenes.[4] The deputy stage manager (DSM) is a separate position in some theaters, while in others the responsibilities of the DSM may be assumed by the stage manager or assistant stage manager.[5]

Assistant stage manager

The assistant stage manager (ASM) has varied responsibilities, which are assigned by the stage manager. The ASM assists in finding and maintaining props during rehearsals and the run of the show. The ASM may take attendance or estimate audience size, may manage the backstage technicians, may act as a liaison between crew, cast and management, and may call some cues. Mundane tasks such as mopping the stage and brewing coffee or tea may fall to the ASM. If the stage manager is unable to perform his or her duties, the ASM must be able to fill in.[6]

Show Control based venues

Many live shows around the world are produced with the forehand knowledge that they will have a very long run, often measured in years. These are usually known quantities that are very expensive productions and have a guaranteed audience because of their location. Typically, they are on cruise ships, in theme parks, Las Vegas or destination resorts such as Branson, Missouri. These shows warrant very long range development and planning and use stage managers to run almost all technical elements in the show, without benefit of many of the other traditional crew members, such as sound, lighting and rigging operators. In these cases, show control systems are installed and connected to all other technical systems in the theatre, which are specifically designed to be controlled by show

control and to operate safely with minimal supervision. Stage managers working these shows usually have the additional responsibility for programming the show control system, and often the other control systems as well.

References

Notes

[1] Thomas, James (1984). *The art of the actor-manager: Wilson Barrett and the Victorian theatre*. UMI Research Press. pp. 203. ISBN 0-8357-1492-6.
[2] Fazio, Larry (2000). *Stage Manager: The Professional Experience*. Focal Press. pp. 367. ISBN 0-240-80410-4.
[3] Parker, W. Oren (1990). *Scene Design and Stage Lighting*. Holt, Rinehart and Winston. pp. 263. ISBN 0-03-028777-4.
[4] Pallin, p. 81
[5] Bond, p. 15
[6] Bond, pp. 15–16

Bibliography

- Pallin, Gail (25 April 2003). *Stage Management: The Essential Handbook* (2 ed.). London: Nick Hern Books. ISBN 1854597345.
- Bond, Daniel (2002). *Stage management: a gentle art* (3 ed.). London: A & C Black. ISBN 0713659831.

Stagehand

A **stagehand** is a person who works backstage or behind the scenes in theatres, film, television, or location performance. Their duties include setting up the scenery, lights, sound, props, rigging, and special effects for a production.

Types of stagehand

- Professional Stagehands
- Audio engineer (A1)
- Assistant audio (A2)
- Electricians
- Light board operator
- Followspot operator
- Carpenters
- Theatrical technician
- Property Master/Mistress

General

Stagehands are usually skilled in multiple disciplines, including rigging, carpentry, stage electrics, stage lighting, audio/projection, and props. Stagehands are often responsible for operating the systems during shows or taping and also for the repair and maintenance of the equipment. Most stagehands have a general knowledge of all the phases of a production, but tend to develop specialties and focus on specific areas.

Riggers are in charge of the things that hang. This may include building structures that are tens of stories high. They use safety gear similar to that used for mountain climbing.

Carpenters construct and set up scenery. They also move scenery on stage during a show.

Electricians set up all the lights, program the light design in the lighting console and run the follow spot (what lay people often call a spot light).

Stagehands are generally employed on a show-by-show basis, although most major theaters and studios maintain staff heads of departments and assistants. Often, they are union members, typically I.A.T.S.E. in North America.

Challenges

Stagehands may work in many different venues, including traditional theatrical spaces large and small, convention centers, outdoor venues, concert arenas, film sets, television studios and others. Skilled stagehands know how to work in a wide range of theaters and other venues to support successful shows.

Different disciples experience different risks. The most serious injury risk for riggers is falling. The primary risks for carpenters are things falling on them or being injured by power tools. Electrocution is the most serious risk for the particular stagehand working with lighting and show power.

When a show travels or "goes on tour" some stagehands travel with the show ("the road crew") and others work to support the shows at each new venue ("the local crew"). Usually everything the show needs is transported from venue to venue in trucks. Local stagehands "load in" a tour under the direction of the road crew. This can involve moving tens of thousands of tons worth of equipment from the trucks to the local venue.

After the show, which can be one day or as long as a month, they take it all apart and load back onto the fleet of trucks to haul it to the next city.

When a show is produced locally, stagehands build and set up the scenery, hang all the lights, and set up sound systems. Stagehands work closely with the directors, lighting designers, set designers, costume designer, and sound designers to ensure their visions are realized.

Some stagehands work conventional hours but more often they work nights and weekends. Employment can be intermittent due largely to the seasonal nature of theatrical production work.

Many production companies and venues have union contracts. Stagehands are represented by the International Alliance of Theatrical Stage Employees. In some smaller productions, stagehands are not all paid, many are volunteers, theatre students or unpaid interns.

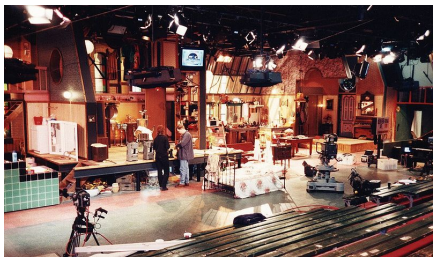
Touring stagehands

Some shows do not stay in one particular theater, but rather circulate through many theaters. These shows usually travel with one or two hands for each department (often referred to as "roadies") and use local stagehands from the area where the show is performing if needed.

Set construction

Set construction is the process by which a set designer works in collaboration with the director of a production to create the set for a theatrical, film or television production. The set designer produces a scale model, scale drawings, paint elevations (a scale painting supplied to the scenic painter of each element that requires painting), and research about props, textures, and so on. Scale drawings typically include a groundplan, elevation, and section of the complete set, as well as more detailed drawings of individual scenic elements which, in theatrical productions, may be static, flown, or built onto scenery wagons. Models and paint elevations are frequently hand-produced, though in recent years, many designers and most commercial theatres have begun producing scale drawings with the aid of computer drafting programs such as AutoCAD or Vectorworks.

Carpenters work on constructing the set



A finished set

The technical director or production manager is the person responsible for evaluating the finished designs and considering budget and time limitations. He or she engineers the scenery, has it redrafted for building, budgets time, crew and materials, and liaisons between the designer and the shop. Technical directors often have assistant technical directors whose duties can range from drafting to actually building scenery.

A scene shop is often overseen by a shop foreman or master carpenter. This person assigns tasks, does direct supervision of carpenters, and deals with day-to-day matters such as absences, breaks, tool repair, etc. The staff of a scene shop is usually referred to as scenic carpenters, but within that there are many specialities such as plasterers, welders, and scenic stitchers. Scenic painting is a separate aspect of scenic construction, although the scenic painter usually answers to the technical director.

There is also usually another person often referred to as a jack of all trades, or as a Fred-John. He or she doesn't specialize in a particular aspect of construction, but is skilled to some degree in most.

External links

- Master's Degree in Scenography and Contemporary Cities in Barcelona [1]

References

[1] http://www.uic.es/en/scenography

Fly system

A **fly system** is a system of ropes, counterweights, pulleys, and other related devices within a theatre that enables a technical crew to quickly move components such as curtains, lights, and scenery on and off stage by moving them vertically between the stage and the large opening above the stage. This is in contrast to the other three types of theatrical component transport systems, scenery wagons, stage lifts and stage turntables, which move scenery without utilizing the space above the stage.[1]

Fly gallery of the Theater Bielefeld in Germany

The opening above the stage is known by various names including *flyspace, flyloft,* and *fly tower.* A component is said to be "flying in" when it is being lowered toward the stage, and "flying out" when it is being raised into the flyspace.

Types of fly systems

There are a number of types of fly systems. The most common is the counterweight fly system, in which a counterweight-carrying arbor moves up and down a track parallel to a wall. Some older theatres, which are sometimes called "hemp houses" (a reference to the material used in the ropes), lack counterweights and instead rely on skilled operators and human strength to fly theatrical scenery in and out. Other types include the pin-rail system—which uses sandbag counterweights and a single pulley for the control line—and systems that are powered by electric motors.

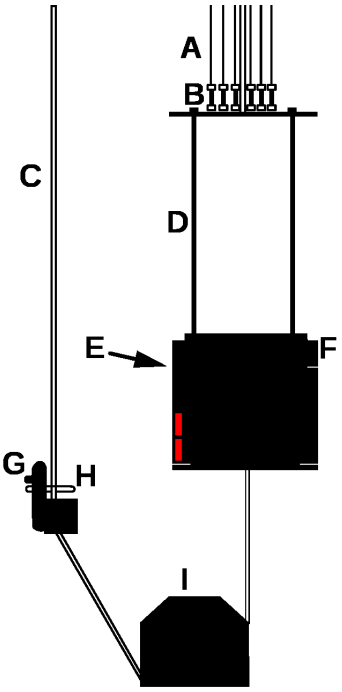
The use of a particular type of fly system in a theater does not preclude the use of other types of fly systems in the same theater. For example, theaters that incorporate built-in, grid-based counterweight fly systems often will also support additional, relocatable hemp system linesets for spot-rigging.

Counterweight fly system

In a typical counterweight fly system, an *arbor* is employed to balance the weight of loads that are to be raised and lowered above the stage. The arbor, which carries a variable number of counterweights, moves up and down a vertical track alongside a wall. In some fly systems, cable guide wires are used instead of tracks to guide the arbors and limit their horizontal movement.

The top of the arbor is permanently attached to several load bearing hoisting cables, known as *lift lines*, which are typically made of galvanized steel aircraft cable. The lift lines run from the top of the arbor up to the top of the fly tower, around the head sheave (pulley), across the stage to the loft sheaves, and then hang down at evenly spaced intervals across the width of the stage. The hanging ends of the lift lines are attached to a batten, which is a long, load-bearing pipe that spans the full width of the stage.

The arbor's vertical position is controlled by means of a long rope known as the *purchase* line. The purchase line forms a loop by running from the bottom of the arbor down to and around the tension sheave, through the lockrail, up and over the head sheave and back down with the lift lines, where it terminates by attaching to the top of the arbor. The head and tension sheaves are located at the top and bottom of the arbor's entire movement track, respectively, thereby enabling an operator to pull the purchase up or down to move the arbor. When the arbor is raised via the purchase line, the lift lines slacken, which causes the batten to lower due to its weight (and the weight of its load, if any). Conversely, when the arbor is lowered, it pulls the lift lines down, which in turn causes the batten to rise.



Graphic depiction of a single lineset and the parts of a counterweight system. (A) Hoisting cables, (B) Turnbuckles, (C) Purchase line, (D) Arbor rod, (E) Spreader plates, (F) Cut steel counterweight, (G) Rope stop/lock (brake)/Lock rail, (H) Locking safety ring, (I) Tension sheave (block). Not shown: head sheave, loft sheaves, and batten.

The combined weight of the arbor and its counterweights initially matches that of the batten so that when the batten is not being raised or lowered, it will tend to remain motionless at any arbitrary elevation above the stage. As more weight is added to the batten (in the form of curtains, scenery, lighting equipment, and rigging hardware), the system is rebalanced by adding more counterweights to the arbor. When the system is properly balanced, an unassisted operator can lift the batten and its arbitrarily heavy load off the stage ("fly it out", in theatrical terminology), completely above the proscenium and out of view of the house, sometimes to heights as great as 70 feet (21 m).

The mechanical system that raises and lowers a specific batten is called a *lineset*. Some large theatres, such as the Metropolitan Opera House (Lincoln Center), have more than 100 independent, parallel linesets, while smaller venues may only have a few linesets for the most commonly adjusted loads, such as electrics.

Arbor

An arbor is a sturdy mechanical assembly that serves as a framework for holding counterweights. In its simplest form, an arbor consists of two horizontal steel plates, one at the top and the other at the bottom of the arbor assembly, connected together by two vertical steel rods. Counterweights are stacked as required on the arbor's bottom plate to balance the lineset load, with the weights held in alignment by the arbor rods.

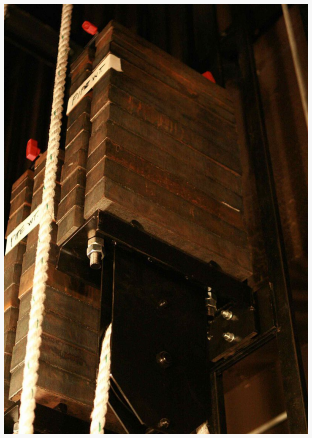
In order to avoid unreasonably tall counterweight stacks, high capacity arbors may support multiple stacks. Such arbors incorporate top and bottom plates having a width equal to a multiple of that of single-width arbors, with the plates interconnected by multiple pairs of rods (one pair per counterweight stack).

Spreader plates

Spreader plates, which are thin steel plates with holes through which the arbor rods pass, are lowered onto the counterweights in a distributed fashion as the counterweight stack is being built. Typically one spreader plate is placed on top of every two feet of counterweight in the stack. Finally, a locking plate is lowered onto the completed, interleaved stack of counterweights and spreader plates and secured in place with a thumbscrew.

Spreader plates serve to maintain consistent spacing between the arbor rods to ensure reliable containment of the counterweights under normal operating conditions. Also, in the event of a "runaway" (loss of control of an unbalanced lineset), the spreader plates will prevent the arbor rods from bending outward, and thus releasing the counterweights upon arbor impact at the end of its travel.

Counterweight arbors



Counterweight arbor viewed from below. The guide rail can be seen at the rear of the arbor.

A large counterweight arbor with multiple stacks.

Top of an arbor, with attached lift lines visible.

Spreader plates, used to maintain arbor rod spacing.

Counterweights

Counterweights are made of lead, pig iron, or flame-cut steel. In any particular fly system all weights share a common, standardized footprint that matches the system's arbors. Although there is no unified dimensional standard for counterweight footprints, counterweight systems are most often designed to use either 4 or 6-inch (150 mm) wide plates. Weights vary in thickness, typically in half-inch increments ranging from 1/2 to 2 inches (51 mm), with each thickness corresponding to a different mass. Counterweights are sometimes also known as *bricks* or simply *steel*. Often a rigging worker will be asked to load a number of inches of steel, which correlates to a specific mass. Weights are usually loaded from the loading bridge, but can also be loaded from the fly gallery or locking rail.

When viewed from the top, a counterweight is fundamentally rectangular, though some counterweights have 45-degree angle cuts at two opposing corners. A slot is cut into each end of the weight so as to enable the weight to straddle, and be locked in place by, the arbor rods. In order to facilitate removal of weights with angle cuts, it is customary to stack the weights in alternating orientations so that the square corners of any weight will be aligned with the angled corners of adjacent weights. This simplifies removal because the protruding square corners of the topmost weight effectively serve as "handles" that can be easily gripped, even with gloved hands.

It is customary to apply paint (typically yellow) or colored tape to the weights that counterweight the batten (pipe) to indicate that they should not be removed from the arbor. When draperies are permanently flown, their respective weights are also often indicated in a similar fashion.

Batten

A *batten*, or *pipe batten*, is a long steel pipe that is suspended by two or more lift lines that all belong to the same lineset. Various loads, such as lights, curtains, and scenery may be directly attached to a batten. A batten and its load can be raised up toward the flyspace ("flown out") or lowered near to the stage floor ("flown in") by its associated lineset. It typically spans the width of the stage and is usually maintained parallel to the stage floor, regardless of elevation.

Battens near the grid in the flyspace.

Loads are attached to the batten in various ways. Most lights, for example, utilize a C-clamp to rigidly secure the light onto the batten, in conjunction with a safety cable that is looped around the batten to prevent the light from falling should the C-clamp connection fail. Non-traveling curtains often employ cloth ties, similar to shoestrings, that are hand tied onto the batten.

Locking rail

A locking rail is located on the stage deck or on a backstage catwalk, oriented perpendicular to the proscenium arch and extending from the proscenium to the back wall. It has a lever-operated rope lock, which clamps the rope so as to prevent a balanced load from drifting, and a safety lock for each lineset. In most cases the locking rail has a headset system or a cue light system to signal the flyrail crew. It is possible to load (add or remove counterweights) at the locking rail, but standard practice is to load at the loading bridge.

Locking rail with arbors, counterweights, rope locks (red) and pins for spot lines visible.

Multiple-speed counterweight systems

Multiple-speed counterweight systems, also known as double purchase systems, create a two-to-one mechanical advantage that causes the batten to move twice as far as the arbor. Because the travel of the arbor is half that of the fly tower, it is possible to locate the locking rail above the stage floor and, as a result, this type of system is commonly employed in theaters that have limited offstage space, as it requires no floor space for the locking rail. Because of the mechanical advantage provided by this system, though, it is necessary to load twice the weight of the batten load to balance the system.[2]

In a conventional counterweight system (i.e., no mechanical advantage), the lift lines attach directly to the top of the arbor and the purchase line attaches to the arbor bottom. In a multiple-speed system, however, the lift lines attach to a point just below the head block and then travel down, looping through a pulley that is mounted to the top of the arbor before rising up and around the head block, thus creating a mechanical advantage. Without compensating for this advantage the purchase line would have to travel twice as far as the batten, so an additional pulley is mounted to the bottom of the arbor to restore the one-to-one relationship between purchase line and batten travel. The purchase line is secured to the stage floor and then it travels up to and around the pulley mounted to the arbor bottom before traveling down and around the tension block, and then back up through the locking rail.[2]

Hemp fly system

A small pin-rail at stage level.

A hemp fly system, so named for the type of rope that was once used for rigging, is both the oldest and simplest type of fly system.[3] A purchase line (rope) is run to the grid, with one end dangling for the operator and one end holding sandbag counterweights. A trim clamp, commonly known as a "knuckle-buster", is attached to both the purchase line and the lift line (or lines), which in turn attaches to the batten. In cases where the lineset lacks a rope to raise the sandbags, the batten is kept a few pounds heavier than the counterweight so that it can be flown in. In some hemp systems a separate line (often called a "bag line") is attached to the sandbags and rigged through a sheave above the operating rail; this is used to pull the sandbags upward and cause the batten to fly in. A pin rail is used to tie off, or belay the hauling end of a rope so as to keep the batten in place when it is not moving.

Hemp systems can be easily configured for spot rigging, where lift lines must be frequently relocated. They are generally less expensive and easier to install than counterweight fly systems, though somewhat more difficult to operate.

Pin rail

A pin-rail above stage level.

A *pin rail* is a large, horizontal wooden beam or steel pipe (the "rail") which has holes that accept belaying pins. Depending on the pin rail design, the pins, which are typically made from hardwood or steel, may be removable or they may be permanently fixed to the rail. Some theaters have permanent pin rails installed along the edge of the loading gallery, while others have mobile pin rails which can be bolted down.

Each belaying pin serves as an anchor to which the loose end of a rope may be quickly secured. A standardized method is used to tie off the rope so that it is subjected to friction from itself as well as from the pin rail, thus ensuring a secure connection that is unlikely to fail.

Motorized fly systems

There are two predominant varieties of winch-driven fly systems, both of which are similar to the counterweight fly system described above. One of these is fundamentally a classic counterweight system with the addition of a winch motor, located below the locking rail, that drives the purchase line. In this type of system, motors may be attached to linesets as needed. The other type of system is more like an elevator winch, with a cable drum that directly drives the lift lines, and no purchase line is involved. Winches are helpful for moving extremely heavy linesets. Electric linesets, for example, may be loaded with batten, circuit raceway, and lighting instruments that can weigh upwards of 1500 lb (680 kg). Many winches, however, can only move linesets at speeds that are a fraction of that delivered by an experienced flyman and thus are not used unless high power or remote operation is needed.

A fly system winch mounted to the floor behind the locking rail. This winch, which operates a high capacity electric lineset, has a quad-wide arbor and is rated for 1200-pound (540 kg) loads.

Many modern large theatres use motorized systems without the aid of counterweights at all. In such systems, the batten is connected via wire rope directly to a drum, which in turn is powered by a geared motor. Speeds in excess of 2,000 mm/s, with loads greater than 1,000 kg are possible and only limited by the availability of power and space for larger motor gear box units. Digital control systems incorporating computers or programmable logic controllers (PLCs) have become commonplace as well, bringing their advantages of high accuracy, safety and repeatability to fly systems.

Parts of a fly system

Flyrail

The *flyrail* is a locking rail or pin rail that is used by a fly crew to operate the fly system. A *deck rail* is a stage-level flyrail, whereas a *mid rail* is located above the stage, giving the fly crew a good view of the stage and also serving to increase off-stage space for performers and scenery.

Loading bridge

Specific to a counterweight system, the *loading bridge* is a catwalk located directly above the flyrail at grid level. Technicians reside on and are supported by the loading bridge while adding or removing counterweights from linesets. The floor of the loading bridge is also typically used as a storage area for uncommitted counterweights that are available for loading onto lineset arbors.

Grid

The *grid* is a steel lattice or slotted wood or steel beam floor found at the top of some fly lofts. It supports the weight of all of the various loads (curtains, scenery and lights) being flown, as well as some of the equipment used to fly those loads. In some cases it enables technicians to walk over the fly loft so that they can easily configure lift lines and loft-blocks (pulleys that drop lift lines down to battens) and thus change the stage locations where the battens will fly in. Due to height limitations in some theaters, not all fly systems are equipped with a grid. In gridless fly systems, the loft blocks are attached to the fly loft ceiling and consequently the battens have fixed fly-in locations and spot-rigging is not possible.

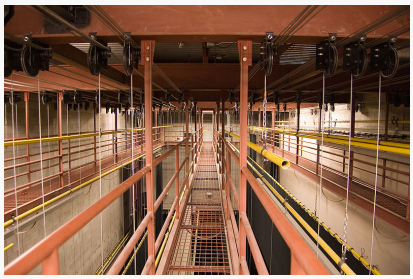
Fly tower

The *fly tower* is the large space above the stage into which fly system loads are raised. In a full size flyspace, the tower is at least 2.5 times as tall as the proscenium, thereby allowing a full-height set piece to be stored completely out of view of the audience. The loading bridge and, if present, the grid, are located at the top of the fly tower.

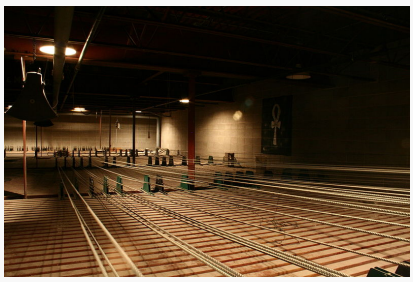
Parts of a fly system

Linesets are manually operated from a *lock rail* such as this one.

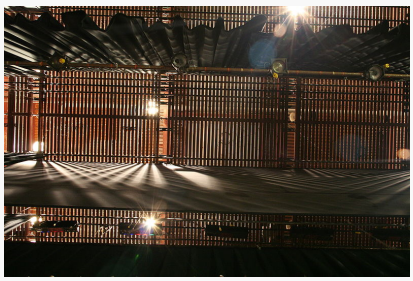
Loading bridge. Weights are seen on floor.



Gridless fly tower. Battens (yellow), under hung pulleys and cables are visible.



Steel lattice grid with top mounted pulleys and cables visible.



Steel lattice grid, viewed from below with drapes, battens, and electrics visible.

Loft blocks on a steel lattice grid.

Common uses

Electrical devices

Electrical battens, which are commonly called *Electrics*, are battens that are specifically designed to support lighting instruments and, in some cases, microphones and special effects equipment as well. Electrics have integral electrical conduits to convey wiring between the lighting instruments, which hang from the batten, and remote, programmable dimmer controls. There are normally three or four electrics in a theater, with the one furthest upstage being the cyclorama.

In most cases, electrics are assigned to dedicated linesets as they have permanent connections to cables that hang from the grid. Additional battens may serve as electrics as well, although doing so can be problematic as non-electrical battens usually lack provisions for electric wiring. Multicable is one solution to the problem of wiring to these battens.[4]

Set pieces

In many productions, set pieces are flown in and out so as to quickly change the scenery during the course of a performance. For example, soft painted drops are commonly used to depict backgrounds. Also, solid, three-dimensional sets may be flown in and hung above the stage or set in contact with the deck.

It is not uncommon to see an entire orchestra shell being manipulated by a fly system. Larger, multi-use theaters that must frequently convert the stage from a drama theatre to a concert hall often make use of the fly system in this way.

Drapery

Fly systems are often used to manipulate theater drapes and stage curtains such as teasers, travelers, legs, cycs and scrims in order to mask the stage or provide backgrounds.

Focus Chairs

A less common use for the fly system is the use of a Focus Chair system. This is a system where a small platform is attached to a track that runs the entire length of the batten. An electrician sits on this small platform, and is flown out to the height of the electrics, where they focus instruments from.

Operation

Because fly systems involve large amounts of weight, and particularly because the weight is usually suspended above people, there are a number of common precautions taken to ensure safety and prevent injuries. Communication, inspection, and loading procedure are key to the safe operation of a fly system.

Calling movement

Except for during performances and some rehearsals, a standard practice in theatre is for the flyman to always call (shout) out a warning before moving a lineset so as to alert personnel (e.g., rehearsing performers and technicians) who are on the stage. People on stage typically acknowledge the operator's warning by yelling out a confirmation that the warning was heard.

The flyman's warning specifies what is moving and its direction of movement. For example, a particularly verbose call might be something like "lineset three, first electric flying in to the deck, downstage." In many theaters, all people on stage are expected to respond with "thank you." Upon completion of the lineset motion, some operators may call again (e.g., "lineset three locked") to announce that the lineset has stopped moving.

Runaways

A *runaway* is a moving lineset that cannot be safely controlled by its operator. Runaways can occur when the weight on the arbor is not equal to the weight of the batten and its load. Linesets are often intentionally unbalanced to facilitate quick flying in one direction and, in such cases, runaways are more likely to occur.

In the rare event that an unbalanced lineset gains so much momentum that the operator cannot stop it, a specified safety procedure is usually followed. Venues typically establish a standard call for this event, which might sound something like "Runaway 47, upstage, heads." Operators are trained not to attempt to stop a runaway lineset but rather to warn others and safely escape. The reason for this is that it is unlikely that they will be able to stop it, and very likely that they will burn their hands or be lifted up by the lineset, potentially injuring themselves on the structure above them. Furthermore, this might position the operator in the path of the batten, arbor, or sandbag as they accelerate downward. Spreader plates are used in counterweight arbors to keep the arbor's vertical rods from bending and releasing the counterweights in the event of a runaway, while the locking plate prevents the counterweights from bouncing out of the arbor.

Loading procedure

When loading a batten, or arbor in a counterweight system, it is imperative to control the balance of a set. The lineset should be balanced before loading begins, then the batten flown in, the set added, and then the counterweight added from the loading bridge. The specific order is important because it keeps the set from being unbalanced in a position where it could run away. When it is batten-heavy (after the set is added, but before the counterweights) the arbor does not have anywhere to run away to as it is already at its grid stop (the upper end of the track). In cases where the set is too tall for the batten to be all the way in, it should be kept as far down as possible. It is always best to add the load in pieces as small as practical and counterweight them one at a time so the system can never get too out of balance. Improper loading procedure is a common cause of accidents in many theaters.

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[3] Jay O. Glerum (2007). *Stage Rigging Handbook, Third Edition*. Southern Illinois University Press. p. 65. ISBN 978-0809327416.
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Lighting designer

The role of the **lighting designer** (or **LD**) within theatre is to work with the director, set designer, costume designer, and sometimes the sound designer and choreographer to create an overall 'look' for the show in response to the text, while keeping in mind issues of visibility, safety and cost. The LD also works closely with the stage manager on show control programming, if show control systems are used in that production. Outside of the theatre the job of a Lighting Designer can be much more diverse and they can be found working on rock and pop tours,corporate launches, art installation and on massive celebration spectaculars, for example the Olympic Games opening and closing ceremonies.

Light designer Robert Edmond Jones (1887-1954) drawing at a waist high table (c. 1920).

During pre-production

The role of the lighting designer varies greatly within professional and amateur theater. For a Broadway show, a touring production and most regional and small productions the LD is usually an outside freelance specialist hired early in the production process. Smaller theatre companies may have a resident lighting designer responsible for most of the company's productions or rely on a variety of

freelance or even volunteer help to light their productions. At the Off-Broadway, or Off-Off-Broadway level the LD will occasionally be responsible for much of the hands-on technical work (hanging instruments, programming the light board, etc.) that would be the work of the lighting crew in a larger theatre.

A Chorus Line was lit using conventional lighting instruments

The LD will read the script carefully and make notes on changes in place and time between scenes - such changes are often done just with lighting to avoid too many blackouts in one scene - and will have meetings (called Design or Production Meetings) with the Director, Designers, Stage Manager and production manager during the pre-production period to discuss ideas for the show and establish budget and scheduling details. The LD will also attend several later rehearsals to observe the way the actors are being directed to use the stage area ('blocking') during different scenes, and will receive updates from the stage manager on any changes that occur. The LD will also make sure that he or she has an accurate plan of the theatre's lighting positions and a list of their equipment, as well as an accurate copy of the set design, especially the ground plan and section. The LD must take into account the show's mood and the director's vision in creating a lighting design.

Lighting at the 2005 Classical Spectacular Concert

Because lighting design is much more abstract than costume or scenic design, it is sometimes difficult for the lighting designer to accurately convey his ideas to the rest of the production team. To help the LD communicate the ethereal aspects of lighting he or she may employ renderings, storyboards, photographs, reproductions of artwork or mockups of actual lighting effects to help communicate ideas about how the lighting should look.

Various forms of paperwork are essential for the LD to successfully communicate their design to various members of the production team. Examples of typical paperwork include cue sheets, lightplots, instrument schedules, shop orders and focus charts.

Cue sheets (or lighting keys) communicate the "look" that the LD has created for the show, using artistic terminology rather than technical language, and information on exactly when each look changes to the next (the latter is not necessary). (Often accomplished with an aerial view of a circle/oval representing a person, and a top view of arrows with colors written next to them indicated source/direction of light, color, and intensity [by using different length arrows].) Cue sheets are of the most value to stage management and the director.

The light plot is a scale drawing that communicates the location of lighting fixtures and lighting positions so a team of electricians can independently install the lighting system. Next to each instrument on the plan will be information for any color gel, gobo, or other accessory that needs to go with it, and its channel number. Often, paperwork listing all of this information is also generated by using a program such as Lightwright. The lighting designer uses this paperwork to aid in the visualization of not only ideas but simple lists to assist the Master Electrician during load-in, focus and technical rehearsals. Professional LDs generally use special computer-aided design packages to create accurate and easily readable drafted plots that can be swiftly updated as necessary. The LD will discuss the plot with the show's production manager and the theatre's master electrician or technical director to make sure there are no unforeseen problems during Load-In.

During installation (Load-In/Focus/Cue to Cue) and technical rehearsals

The lighting designer is responsible, in conjunction with the production's independently hired "Production Electrician" who will interface with the theatre's Master Electrician, for directing the theatre's electrics crew in the realization of his or her designs during the technical rehearsals. After the Electricians have hung, circuited and patched the lighting units, the LD will direct the focusing (pointing, shaping and sizing of the light beams) and gelling (coloring) of each unit. Then the LD usually sits at a temporary desk (tech table) in the theater (typically on the Center Line in the middle of the house) where he or she has a good view of the stage and work with the lighting board operator/programmer, who will either be seated alongside him or her at a portable control console or talk via headset to the control room. At the tech table, the LD will generally use a Magic Sheet, which is a pictorial layout of how the lights relate to the stage, so he or she can have quick access to channel numbers that control particular lighting instruments. The LD may also have a copy of the light plot and channel hookup, a remote lighting console, a computer monitor connected to the light board (so they can see what the board op is doing), and a headset, though in smaller theatres this is less common. After hang and focus, there may be a period of time allowed for pre-lighting or "pre-cueing", a practice that is often done with people known as Light Walkers who stand in for performers so the LD can see what the light looks like on bodies. At an arranged time, the performers arrive and the production is worked through in chronological order, with occasional stops to correct sound, lighting, entrances etc; known as a "cue-to-cue". The lighting designer will work constantly with the board operator to refine the lighting states as the technical rehearsal continues, but because the focus of a "cue-to-cue" or "tech" rehearsal is the production's technical aspects, the LD may require the performers to pause ("hold") frequently. Nevertheless, any errors of focusing or changes to the lighting plan are corrected only when the performers are not onstage. These changes take place during 'work' or 'note' calls. The LD only attends these notes calls if units are hung or rehung and require additional focusing. The LD or ALD will be in charge if in attendance. If the only work to be done is maintenance (i.e. changing a lamp or burnt out gel) then the Production or Master Electrician will be in charge and will direct the Electrics crew.

After the tech process, the performance may (or may not, depending on time constraints) go into Dress rehearsal without a ticketed audience and/or Previews with a ticketed audience. During this time, if the cueing is finished, the LD will sit in the audience and take notes on what works and what needs changing. At this point, the Stage Manager will begin to take over the work of calling cues for the light board op to follow. Generally, the LD will stay on headset, and may still have a monitor connected to the light board in case of problems, or will be in the control booth with the board operator when a monitor is not available. Often, changes will take place during notes call, but if serious problems occur the performance may be halted and the issue will be resolved then.

Once the show is open to the public, the lighting designer will often stay and watch several performances of the show, making notes each night and making desired changes the next day during notes call. If the show is still in previews, then the LD will make changes, but once the production officially opens, normally the lighting designer will not make further changes.

Changes should not be made after the lighting design is finished, and never without the LD's approval. There may be times when changes are necessary after the production has officially opened. Reasons for changes after opening night include: casting changes; significant changes in blocking; addition, deletion or rearrangement of scenes; or the tech and/or preview period (if there was a preview period) was too short to accommodate as thorough a cueing as was needed (this is particularly common in dance productions). If significant changes need to be made, the LD will come in and make them, however if only smaller changes are needed, the LD may opt to send the Assistant Lighting Designer (see below for ALD description). If a show runs for a particularly long time then the LD may come in periodically to check the focus of each lighting instrument and if they are retaining their color (some gel, especially saturated gel, loses its richness and can fade or 'burn out' over time). The LD may also sit in on a performance to make sure that the cues are still being called at the right place and time. The goal is often to finish by the opening of the show, but what is most important is that the LD and the directors believe that the design is finished to each's

satifaction. If that happens to be by opening night, then after opening no changes are normally made to that particular production run at that venue. The general maintenance of the lighting rig then becomes the responsibility of the Master Electrician.

In small theatres

It is uncommon for a small theatre to have a very large technical crew, as there is less work to do. Many times, the lighting crew of a small theatre will consist of a single lighting designer and one to three people, who collectively are in charge of hanging, focusing and patching all lighting instruments. The lighting designer commonly works directly with this small team, fulfilling the role of both master electrician and lighting designer. Many times the designer will directly participate in the focusing of lights, both those in the catwalk and those hanging from battens. The same crew will generally also operate and program the light board during rehearsals and performances. In some cases, the light board and sound board are operated by the same person. The lighting designer may also take on other roles in addition to lights when they are finished hanging lights and programming the board.

Advances in visualization and presentation

As previously mentioned, it is difficult to fully communicate the intent of a lighting design before all the lights are installed and all the cues are written. With the advancement in computer processing and visualization software, lighting designers are now able to create computer generated images (CGI) that represent their ideas. The lighting designer enters the light plot into the visualization software and then enters the ground plan of the theater and set design, giving as much 3 dimensional data as possible (which helps in creating complete renderings). This creates a 3D model in computer space that can be lit and manipulated. Using the software, the LD can use the lights from his plot to create actual lighting in the 3D model with the ability to define paramaters such as color, focus, gobo, beam angle etc. The designer can then take renderings or "snapshots" of various looks that can then be printed out and shown to the director and other members of the design team.

Mockups and lighting scale models

In addition to computer visualization, either full scale or small scale mock ups are a good method for depicting a lighting designer's ideas. Fiber optic systems such as LightBox or Luxam allow a users to light a scale model of the set. For example, a set designer can create a model of the set in 1/4" scale, the lighting designer can then take the fiber optic cables and attach them to scaled down lighting units that can accurately replicate the beam angles of specified lighting fixtures. These 'mini lights' can then be attached to cross pieces simulating different lighting positions. Fiber optic fixtures have the capacity to simulate attributes of full scale theatrical lighting fixtures including; color, beam angle, intensity, and gobos. The most sophisticated fiber optic systems are controllable through computer software or a DMX controlled Light board. This gives the lighting designer the ability to mock up real time lighting effects as they will look during the show.

Additional members of the lighting design team

If the production is large or especially complex, the Lighting Designer may hire additional lighting professionals to help execute the design.

The Associate Lighting Designer

The Associate Lighting Designer will help assist the Lighting Designer in creating and executing the lighting design. While the duties that an LD may expect the Associate LD to perform may differ from person to person, usually the Ass't LD will do the following:

- Attend design and production meetings with or in place of the LD

- Attend rehearsals with or in place of LD and take notes of specific design ideas and tasks that the lighting department needs to accomplish
- Assist the LD in generating the light plot, channel hookup and sketches
- If needed, the Associate may need to take the set drawings and put them into a CAD program to be manipulated by the LD (however, this job is usually given to the Assistant LD if there is one).
- The Ass't LD may be in charge of running focus, and may even direct where the lights are to be focused.
- The Associate is generally authorized to speak on behalf of the LD and can make creative and design decisions when needed (and when authorized by the LD). This is one of the biggest differences between the Associate and the Assistant.

The Assistant Lighting Designer

The Assistant Lighting Designer assists the Lighting Designer and the Associate Lighting Designer. Depending on the particular arrangement the ALD may report directly to the LD, or they may in essence be the Associate's assistant. There also may be more than one assistant on a show depending on the size of the production. The ALD will usually:

- Attend design and production meetings with the LD or the Associate LD
- Attend rehearsals with the LD or the Associate LD
- Assist the LD in generating the light plot and channel hookup. If the plot is to be computer generated, the ALD is the one who physically enters the information into the computer.
- The ALD may run errands for the LD such as picking up supplies or getting the light plot printed in large format.
- The ALD will help the Associate LD in running focus.
- The ALD may take Focus Charts [1] during focus.
- In rare instances the ALD may be the light board operator.

A note on focus

During focus, the LD is up on stage directing members of the Electrics crew on where and how to focus each individual lighting unit. This can be a time consuming and frustrating process. Focus can run much smoother if the Associate LD and the Assistant LD are keeping good track of which lights have been focused, what's coming up next and directing the electrics crew so that there is minimal down time between focusing each light. They should also direct the LD to which units are next and even what their purpose is and a rough focus.

External links

- comprehensive list of UK Lighting Designers [2]
- *How to Work with a Lighting Designer* [3] -- An article (written primarily for choreographers) on process and effective collaboration.
- *Stage Lighting for Students* [4]
- A brief history of stage lighting [5]

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[2] http://www.ald.org.uk/directory.php?type=all"A
[3] http://www.jeffsalzberg.com/lighting.htm
[4] http://www.stagelightingprimer.com
[5] http://www.northern.edu/wild/LiteDes/ldhist.htm

Sound stage

A **sound stage** is a soundproof, hangar-like structure, building, or room, used for the production of theatrical motion pictures and television shows, usually located on a secure movie studio property.

Overview

Structures of this type were in use in the motion picture industry before the advent of sound recording. Early stages for silent movies were built, either as a three-wall open-roof set, or with large skylights, until electric lighting became powerful enough to expose film adequately.

Contemporary building requirements

Extensive soundproofing

With the advent of electric lights, enclosed stages were built in Hollywood and rapidly converted to sound stages with many mattresses placed on the walls. With the coming of the talkies in the late 1920s, it became necessary to enclose and fully soundproof these stages to eliminate noise and distractions from outside, including limiting access.

The ceilings and walls of the building containing the sound stage must be heavily soundproofed, so the structure must be sturdy and capable of accepting such additional features and loads, or a new building specifically designed with the features and to bear the loads is required, which often is the less expensive alternative to retrofitting an existing structure because of engineering issues.

Buildings without soundproofing still are referred to as **silent stages** and may be used where the dialog and other sounds are recorded as a separate operation. This separate operation usually involves the principal actors doing synchronized dialogue replacement voice recordings over a working cut of the film or, specialized language actors doing a secondary language dubbing.

A sound stage, unlike a silent stage, requires caution to avoid making noise anywhere within range of the audio recording equipment.

Enclosed stage

An enclosed stage makes it easier for the crew of a production to design and build the sets to exact specifications, precise scale, and detail. The art director of a production makes an architectural plan and carpenters build it. On a film the head electrician is credited as the *gaffer* and the assistant as the *best boy*, regardless of gender. After a set is painted, the *set dresser* furnishes it with everything that the *set designer*, under the direction of the *art director*, has selected for the interior.

Catwalks and ceiling lights

On a sound stage, the camera may be placed exactly where the director wants it. Achieving the desired lighting is easier because each stage has a metal framework with catwalks and lights suspended from the ceiling. This makes it easier for the cinematographer to have the *grips* position each flag or bounce and the *lighting technicians* to position each light to get exactly the correct lighting for each right shot.

Cameras, rentals, and special techniques

Television production generally uses multiple cameras and cinema production generally uses a single camera. This is not universally true because the choice varies, very much on what the director is trying to achieve.

Rental of a sound stage entails an expensive process, but working on a sound stage saves time when setting up for production as long as access to all of the necessary technical equipment, personnel, and supplies is readily available. As all the scenes can be filmed on the sets inside the sound stage, using it also eliminates having to move the production from location to location.

With the use of blue screen or green screen techniques (whereby backgrounds are inserted electronically behind the actors in the finished film) and a sound stage, extensive control of the production process is achieved and startling results emerge.

"Soundstage" of an acoustical recording

The term ***soundstage*** refers to the depth and richness of an audio recording and usually relates to the playback process. According to audiophiles, the quality of the playback is very much dependent upon how one is able to pick out different instruments, voices, vocal parts, and such exactly where they are located on an imaginary 2-dimensional or 3-dimensional field. The quality of this soundstage can enhance not only the listener's involvement in the recording, but also their overall perception of the stage.

Motion capture stage

The **motion capture stage** is a filming environment and sound stage dubbed "the volume", where motion capture, sound and film is simultaneously recorded. It is primarily used to produce live-action computer-generated imagery. There can be multiple technology employed in producing a digital capture of performances for film, television and video game industries.

Special effects before filming

The latest technology and software can render basic *previsualisation* effects into scenes in real time while recording, with the use of sensors detecting the position of actors and elements, in the staging of the frame.[1]

References

[1] Avatar 3D film employs cutting edge visual effects (http://news.bbc.co.uk/1/hi/programmes/click_online/8421468.stm) from the BBC, retrieved on 26 January 2010.

Stage lighting

Modern **stage lighting** is a flexible tool in the production of theatre, dance, opera and other performance arts. Several different types of stage lighting instruments are used in the pursuit of the various principles or goals of lighting. Stage lighting has grown considerably in recent years partially due to improved technical equipment and a higher interest from young people.

"Runaways" used conventional stage lighting and theatrical fog

Functions of lighting

Stage lighting has several functions, although to allow for artistic effect, no hard and fast rules can ever be applied. The functions of lighting include:

- **Illumination:** The simple ability to see what is occurring on stage. Any lighting design will be ineffective if the viewers cannot see the characters, unless this is the explicit intent.
- **Revelation of form:** Altering the perception of shapes onstage, particularly three-dimensional stage elements.
- **Focus:** Directing the audience's attention to an area of the stage or distracting them from another.
- **Mood:** Setting the tone of a scene. Harsh red light has a totally different effect than soft lavender light.
- **Location and time of day:** Establishing or altering position in time and space. Blues can suggest night time while orange and red can suggest a sunrise or sunset. Use of gobos to project sky scene, moon etc.
- **Projection/stage elements:** Lighting may be used to project scenery or to act as scenery onstage.
- **Plot(script):** A lighting event may trigger or advance the action onstage.
- **Composition:** Lighting may be used to show only the areas of the stage which the designer wants the audience to see, and to "paint a picture".[1] [2]

Classical Spectacular used ordinary stage lighting plus special laser effects

An example of a rig including moving head, generic and LED fixtures at 'The Tuesday Club'

While Lighting Design is an art form, and thus no one way is the only way, there is a modern movement that simply states that the Lighting Design helps to create the environment in which the action take place while supporting the style of the piece. "Mood" is arguable while the environment is essential.[3]

Qualities in lighting

The four main qualities or properties of lighting are intensity, color, pattern and focus.

Intensity

Measured in lux, lumens and foot-candles. For any given luminaire (lighting instrument or fixture), this depends upon the power of the lamp, the design of the instrument (and its corresponding efficiency), the presence or absence of colour gels or gobos, distance from the area to be lit and the beam or field angle of the fixture, the colour and substance to be lit, and the neuro-optics of the total scene (that is, the relative contrasts to other regions of illumination).[4]

Colour

Colour temperature is measured in kelvins, and gel colours are organized by several different systems maintained by the colour manufacturing companies. The apparent colour of a light is determined largely by the gel colour given it, but also in part by the power level the lamp is being run at and the colour of material it is to light.[4] As the percentage of full power a lamp is being run at drops, the tungsten filament in the bulb glows orange instead of more nearly white. This is known as *amber drift* or *amber shift*. Thus a 1000-watt instrument at 50% will appear far more orange than a 500-watt instrument at full.[5]

LED fixtures create colour through additive colour mixing with red, green, and blue LEDs at different intensities. This type of colour mixing is also used frequently with borderlights and cyclorama lights to create different colours on stage and on the cyclorama. Another form of colour mixing is CMY, or subtractive colour mixing. Cyan, magenta and yellow dichroic filters are used in different percentages to create different colours. Because it is often difficult to create true reds and greens, a green dichroic filter is often added to fixtures using this method of colour mixing.

Pattern

A gobo of this shape in a fixture with a red gel would produce a pattern like the one shown to the right.

Pattern refers to the shape, quality and evenness of a lamp's output. The pattern of light an instrument makes is largely determined by three factors. The first are the specifics of the lamp, reflector and lens assembly. Different mounting positions for the lamp (axial, base up, base down), different sizes and shapes of reflector and the nature of the lens (or lenses) being used can all affect the pattern of light. Secondly, the specifics of how the lamp is focused affect its pattern. In *ellipsoidal reflector spotlights (ERS)* or *profile spotlights*, there are two beams of light emitted from the lamp. When the cones of both intersect at the throw distance (the distance to the stage), the lamp has a sharply defined 'hard' edge. When the two cones do not intersect at that distance, the edge is fuzzy and 'soft'. Depending on which beam (direct or reflected) is outside the other, the pattern may be 'thin and soft' or 'fat and soft.' Lastly, a gobo or break up pattern may be applied to ERSs and similar instruments. This is typically a thin sheet of metal with a shape cut into it. It is inserted into the instrument near its aperture. Gobos come in many shapes, but often include leaves, waves, stars and similar patterns.[6]

Focus, position, and hanging

Many stage lights hang on a batten focused in several directions

Focus is a term usually used to describe where an instrument is pointed. The final focus should place the "hot spot" of the beam at the actor's head level when standing at the centre of the instrument's assigned "focus area" on the stage. **Position** refers to the location of an instrument in the theater's fly system or on permanent pipes in front-of-house locations. **Hanging** is the act of placing the instrument in its assigned position.[7]

In addition to these, certain modern instruments are automated, referring to motorized movement of either the entire fixture body or the movement of a mirror placed in front of its outermost lens. These fixtures and the more traditional follow spots add **Direction** and **Motion** to the relevant characteristics of light. Automated fixtures fall into either the *moving head* or *moving mirror/scanner* category. Scanners have a body which contains the lamp, PCBs, transformer, and effects (color, gobo, iris etc.) devices. A mirror is panned and tilted in the desired position by pan and tilt motors, thereby causing the light beam to move. Moving head fixtures have the effects and lamp assembly inside the head with transformers and other electronics in the base or external ballast. There are advantages and disadvantages to both. Scanners are typically faster and less costly than moving head units but have a narrower range of movement. Moving head fixtures have a much larger range of movement as well as a more natural inertial movement but are typically more expensive.[8]

The above characteristics are not always static, and it is frequently the variation in these characteristics that is used in achieving the goals of lighting.

Stanley McCandless was perhaps the first to define controllable qualities of light used in theater. In *A Method for Lighting the Stage*, McCandless discusses *color, distribution, intensity and movement* as the qualities that can be manipulated by a lighting designer to achieve the desired visual, emotional and thematic look on stage. The McCandless Method, outlined in that book, is widely embraced today. The method involves lighting an object on the stage from three angles—2 lights at 45 degrees to the left and right, and one at 90 degrees (perpendicular to the front of the object).[9] [10]

Lighting professionals

The lighting designer

Using lighting to affect the audience's senses and evoke their emotions. The lighting designer is familiar with the various types of lighting instruments and their uses. In consultation with the director and the scenic designer, and after watching sufficient rehearsals, the LD is responsible for providing an *Instrument Schedule* and a *Light Plot*. The Schedule is a list of all required materials, including color gel, gobos, *color wheels*, *barndoors* and other accessories. The light plot is typically a plan view of the theatre in which the performance will take place, with every luminaire marked. This typically includes approximate focus (the direction it should be pointing), a reference number, any accessories required, and the specifics (or *channel number*) of its connection to the dimmer system or lighting control console.[11]

A LD must be accustomed to working around the demands of the director or head planner. Practical experience is required to know the effective use of different lighting instruments and colour in creating a design. Many designers start their careers as lighting technicians in theatres or amateur theatre groups. Often, this is followed by training in one of the many vocational colleges or universities around the world that offer theatre courses. Many jobs in larger venues and productions require a degree from a vocational school or college in theatrical lighting, or at least a

bachelor's degree.

Other positions

In theater:

- Master electrician/chief electrician
- Production electrician
- Lighting programmer
- Lighting operator/light board operator

In film:

- Best boy (electrical)
- Gaffer

In music:

- Rigger

Lighting equipment

Lighting instruments

Source Fours in use at the United States Marine Corps Museum

In the context of lighting design, a lighting instrument (also called a *luminaire*) is a device that produces controlled lighting as part of the effects a lighting designer brings to a show. The term *lighting instrument* is preferred to *light* to avoid confusion between light and light sources.

There are a variety of instruments frequently used in the theater. Although they vary in many ways they all have the following four basic components in one form or other:

- Box/Housing - a metal or plastic container to house the whole instrument and prevent light from spilling in unwanted directions.
- Light source (lamp).
- Lens or opening - the gap in the housing where the light is intended to come out.
- Reflector - behind or around the light source in such a way as to direct more light towards the lens or opening.

Additional features will vary depend on the exact type of fixture.

Most theatrical light bulbs (or *lamps*, the term usually preferred) are tungsten-halogen (or quartz-halogen), an improvement on the original incandescent design that uses a halogen gas instead of an inert gas to increase lamp life and output. Fluorescent lights are infrequently used other than as worklights because, although they are far more efficient, they are expensive to make *dimmed* (run at less than full power) without using specialised dimmer ballasts and only very expensive models will dim to very low levels. They also do not produce light from a single point or easily concentrated area, and usually have a warm-up period, during which they emit no light or do so intermittently. However fluorescent lights are being used more and more for special effects lighting in theaters. High-intensity discharge lamps (or HID lamps), however, are now common where a very bright light output is required—for example in large follow spots, hydrargyrum medium-arc iodide (HMI) floods, and modern automated fixtures. When dimming is required, it is done by mechanical dousers or shutters, as these types of lamps also cannot be electrically dimmed.

Most instruments are suspended or supported by a "U" shaped *yoke*, or 'trunnion arm' fixed to the sides of the instrument, normally near its center of gravity. On the end of such, a clamp (known as a hook-clamp, C-clamp, or

pipe clamp—pipe referring to battens) is normally fixed, made in a "C" configuration with a screw to lock the instrument onto the pipe or batten from which it is typically hung. One secured, the fixture can be panned and tilted using tension adjustment knobs on the yoke and clamp. An adjustable c-wrench, ratchet (US) or spanner (UK) is often used to assist the technician in adjusting the fixture.

Most venues ensure crew and performer safety by attaching a safety cable/chain (a metal wire or chain with a locking carabiner) to the fixture. In the event that the fixture's clamp(s) were to fail, the cable would arrest the fall of the fixture before it could come in contact with a person. Some larger fixtures can weigh over 100 lb (45 kg) and are suspended very high above performers heads. Many venues place strict guidelines regarding the use of safety cables.[12]

All lights are loosely classified as either *floodlights* (wash lights) or *spotlights*. The distinction has to do with the degree to which one is able to control the shape and quality of the light produced by the instrument, with spotlights being controllable, sometimes to an extremely precise degree, and floodlights being completely uncontrollable. Instruments that fall somewhere in the middle of the spectrum can be classified as either a spot or a flood, depending on the type of instrument and how it is used. In general, spotlights have lenses while floodlights are lensless, although this is not always the case.

The entire lighting apparatus, including the lights themselves, the physical structure which supports them, and the cabling, control systems, dimmers, power supplies, and light boards is called the "rig"

Types of lighting fixture

Within the groups of "wash" and "spot" light, there are other, more specific types of fixtures.

Profile

These fixtures feature a compound lens which allows the designer to place obstructions within the image path which are then projected. These obstructions could be "gobos" or shutters. A profile is a spot light, but allows for precise focusing.

Fresnel

A Fresnel is a type of wash light and is named as such due to the Fresnel lens it features as the final optical device within the chain.

Traditionally theatre and stage lighting has been of the "generic" type. These are lights which are focussed, geled, and then simply dimmed to give the effect the designer wants. In recent years the emergence of moving lights (or automated lights) has had a substantial impact of theatre and stage lighting.

A typical moving light allows the designer to control the position, colour, shape, and strobing of the light beam created. This can be used for exciting effects for the entertainment or dancefloor use. Moving lights are also often used instead of having a large number of "generic" lights. This is because one moving light can do the work of several generics.

In the UK the nomenclature is slightly different from North America. This article primarily uses the North American terminology. Although there is some adoption of the former naming conventions it has been normal to categorise lanterns by their lens type, so that what in the US is known as a spotlight is known as a Profile or a Fresnel/PC (Pebble/Plano/Prism Convex) in the UK. A Spotlight in the UK often refers to a Followspot. The following definitions are from a North American point of view. UK naming conventions are used in most of the world, in fact most North American theatres will also use the UK terms except when talking in a more general sense (i.e. get a spotlight to focus on that set piece, or 'flood this area').

In Australia and many other places, the lamps inside a theatrical fixture are referred to as *bubbles*. In North American English, a bubble refers to the protrusion that occurs when one's body (or other oily substance) contacts the lamp. Heat will cause the portion of the lamp which has oil on it to expand when it is on creating the bubble, and causing the lamp to explode. That is why one should never directly touch the glass portion of a lamp. Cleaning with

rubbing alcohol will remove the oil.

Lighting controls

Entertainment Technology's Marquee lighting console.

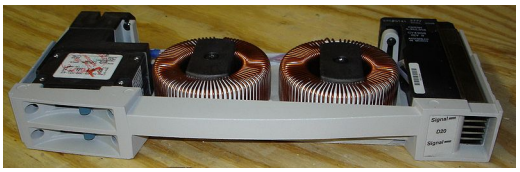
Lighting control tools might best be described as anything that changes the quality of the light. Historically this has been done by the use of intensity control. Technological advancements have made intensity control relatively simple - solid state dimmers are controlled by one or more lighting controllers. Controllers are commonly lighting consoles designed for sophisticated control over very large numbers of dimmers or luminaires, but may be simpler devices which play back stored sequences of lighting states with minimal user interfaces. Consoles are also referred to as lighting desks or light-boards.[13]

For larger shows or installations, multiple consoles are often used together and in some cases lighting controllers are combined or coordinated with controllers for sound, automated scenery, pyrotechnics and other effects to provide total automation of the entire show. See show control.

The lighting controller is connected to the dimmers (or directly to automated luminaires) using a control cable or wireless link (e.g. DMX512) or network, allowing the dimmers which are bulky, hot and sometimes noisy, to be positioned away from the stage and audience and allowing automated luminaires to be positioned wherever necessary. In addition to DMX512, newer control connections include RDM (remote device management) which adds management and status feedback capabilities to devices which use it while maintaining compatibility with DMX512; and Architecture for Control Networks (ACN) which is a fully featured multiple controller networking protocol. These allow the possibility of feedback of position, state or fault conditions from units, whilst allowing much more detailed control of them.[14]

Dimming

A dimmer is a device used to vary the electrical power delivered to the instrument's lamp. As power to the lamp decreases, the light fades or dims. It is important to note that some color change also occurs as a lamp is dimmed, allowing for a limited amount of color control through the dimmer. Fades can be either UP or DOWN, that is increasing or decreasing the intensity. Today, most dimmers are solid state, although many mechanical dimmers still exist.[15]



A pair of modern 2.4 kW dimmers by Electronic Theatre Controls

Dimmers are often found in large racks that draw large amounts of three-phase electrical power. The dimmers themselves are often removable modules that range from a 20-ampere, 2.4-kilowatt unit to a 50-ampere or even a 100-ampere unit. They can often be replaced by a **constant power module (CPM)** which is basically a 20- or 50-ampere breaker in a dimming module casing. Constant power modules are used to supply non-dimming current to other electrical devices (like smoke machines, chain winches, or scenic motors). When a constant power module is installed, the corresponding circuit is *energized* as long as the dimming pack is on, independent of the lighting console. Failure to use a constant power module on a non-dimming device can result in the damage of the device, specifically when the device relies on an internal transformer that depends on a specific power standard (in the US, 110 V, 60 Hz power).[16] Even if a dimmer channel is trusted to always be operated at full power, during start up and shut down cycles of a lighting control surface, small amounts of noise interference and DMX signal-recycling can cause momentary interruptions in the data stream and cause a dimmer to dim a circuit, so a CPM is necessary to

ensure that equipment is not damaged.

Increasingly, with the growth of digital technology, modern lighting instruments are available which allow remote control, not just of intensity, but of direction, color, beam shape, projected image, beam angle and a wealth of other effects. The ability to move an instrument ever more quickly and quietly has become the industry goal. Such automated lights frequently have built-in dimming and so are connected directly to the control cable or network and are independent of external dimmers.

Further reading

- Pilbrow, Richard (2008) *Stage Lighting Design: The Art, the Craft and the Life*, Nick Hern Books, London. ISBN 978-1854599964.

See also

- DJ lighting
- High-key lighting
- Low-key lighting
- Tree lights

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[12] Connecticut College Theater Services Hazard Communication Guide (http://www.conncoll.edu/offices/ehs/9134.htm), Please see 'Lights' section.

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[16] Gillette, J. Michael (2003). *Designing With Light: An Introduction to Stage Lighting, Fourth Edition*. McGraw Hill. pp. 92. ISBN 0-7674-2733-5.

External links

- FAQ (http://www.faqs.org/faqs/theatre/stagecraft/faq/) from the Stagecraft mailing list
- Stage Lighting for Students (http://stagelightingprimer.com/)
- How to Work with a Lighting Designer (http://www.jeffsalzberg.com/lighting.htm)
- Stagelink (http://www.stagelink.com/resources/Professionals/Lighting/Lighting-Designers) Directory of Lighting Designers
- UK Sound and Lighting Community (http://www.ukslc.org)
- Blue-Room Technical Forums (http://www.blue-room.org.uk)
- DMX Explained (http://www.bertold.org/en/Electronics/dmx-explained.html)

Theatrical property

A **theatrical property**, commonly referred to as a **prop**, is an object used on stage by actors for use in the plot or story line of a theatrical production. Smaller props are referred to as "hand props". Larger props may also be set decoration, such as a chair or table. The difference between a set decoration and a prop is use. If the item is not touched by a performer for any reason it is simply a set decoration. If it is touched by the actor in accordance to script requirements or as deemed by the director, it is a prop.

A theatrical prop grammophone used in a professional production of *My Fair Lady*

History

Small acting troupes formed during the renaissance, travelled throughout Europe. These "companies," functioning as cooperatives, pooled resources and divided any income. Many performers provided their own costumes, but special items: stage weapons, furniture or other hand-held devices were considered "company property," thus the term "property," which eventually was shortened to "prop."[1] [2] The first known props were stylized hand held masks, called Onkoi, used by performers in "Greek Theatre" and have become symbols of theatre today, known as the "comedy and tragedy masks".

On stage, backstage

The term "theatrical property" originated to describe an object used in a stage play and similar entertainments to further the action. Technically, a prop is any object that gives the scenery, actors, or performance space specific period, place, or character. The term comes from live-performance practice, especially theatrical methods, but its modern use extends beyond the traditional plays and musical, circus, novelty, comedy, and even public-speaking performances, to film, television, and electronic media.

Props storage room of the National Theatre, Mannheim, Germany

Props in a production originate from off stage unless they have been preset on the stage before the production begins. Props are stored on a prop table backstage near the actor's entrance during production then generally locked in a storage area between performances. The person in charge of handling and buying/finding the props is called the props master/mistress.

Modern usage

The term has readily transferred to television and motion picture production, where they are commonly referred to by the phrase **movie prop** or **film prop**. In recent years, the increasing popularity of movie memorabilia (a broader term that also includes costumes) has added new meaning to the term "prop," broadening its existence to include a valuable after-life as a prized collector's item. Typically not available until after a film's premiere, movie props appearing on-screen are christened "screen-used", and can fetch thousands of dollars in online auctions and charity benefits.[3] [4]

Props are generally distinct from the costumes worn by the actors, the scenery (sets) or other large objects that can be considered part of the stage. Occasionally, if a period-piece item of clothing is handled or otherwise appears on screen, but is never worn by an actor, then it would be the responsibility of the prop master, and thus considered a prop. For example, belts, stockings, hats, and other normally wearable items may be considered as props if they are merely picked up by an actor or used for alternate purposes. Similarly, a scene in a shoe store may require numerous prop shoes to fill the sets shelves, and therefore will be handled by the prop master or set decorator.

Many props are ordinary objects. However, a prop must "read well" from the house or on-screen, meaning it must look real to the audience. Many real objects are poorly adapted to the task of looking like themselves to an audience, due to their size, durability, or color under bright lights, so some props are specially designed to look more like the actual item than the real object would look. In some cases, a prop is designed to behave differently than the real object would, often for the sake of safety.

Examples of special props are:

- A prop sack representing a burlap bag that might have one side starched or sized to stiffly duplicate a particular shape which a real (and limp) burlap bag would be unlikely to collapse into by chance.
- A prop weapon (such as a stage gun or a stage sword) that reads well but lacks the intentional harmfulness of the corresponding real weapon. In the theater, prop weapons are almost always either non-operable replicas, or have safety features to ensure they are not dangerous. Guns fire caps or noisy blanks, swords are dulled, and knives are often made of plastic or rubber. In film production, fully functional weapons are mostly used, but typically only with special smoke blanks with blank adapted guns instead of real bullets. Real cartridges with bullets removed are still dangerously charged which has caused several tragic instances when used on stage. The safety and proper handling of real weapons used as movie props is the premiere responsibility of the *prop master,* who is often monitored by off-duty police, fireman, and/or ATF agents.
- Breakaway objects, or *stunt props,* such as balsa-wood furniture, or sugar glass (mock-glassware made of crystallized sugar) whose breakage and debris look real but rarely cause injury due to their light weight and weak structure. Even for such seemingly safe props, very often a stunt double will replace the main actor for shots involving use of breakaway props. Rubber bladed-weapons and guns are examples of props used by stuntmen to minimize injury, or by actors where the action requires a prop which minimizes injury.[5]

Property department crossovers

Props will sometimes have crossover requirements, needing to be addressed by the different departments.

- If an item is worn, it is a costume. If it is merely held, it is a prop. Hats, watches, glasses, purses, and even jewelry can be considered a prop under the right circumstances. These items may still need approval from the costume designer.
- Specialty props such as battery powered flickering candles, lanterns or flashlights may be purchased or pulled (out of stock) by the props designer and be supervised by the lighting designer and head electrician.
- Working and nonworking microphones, hand held and floor standing, may fall under the prop department as well as sound. Any prop that makes an audible noise loud enough to be picked up by mics should also be coordinated with the sound designer as well as any item that obstructs/mutes or amplifies sound.

- Musical instruments played on stage by a performer may also need to be coordinated with the musical director and/or orchestra leader.
- Devices used by a performer to operate an electrical or electronic device are not considered props and fall under the purview of the electrical or stage electronics department. Examples include a switch which operates a practical (working) lamp or a game show ring-in/lockout device.

The choice of evoking the legal concept of "property" in naming props probably reflects the issues of prop management. The performer using a prop has to eventually let go of it, either because the character being played does so, or in order to take a bow or effect a change of costume or makeup. Even if the value of the item is negligible, the effort of realizing it is gone and replacing it is probably not, and it is efficient to take steps to ensure it is at hand for the next performance. Thus a prop's availability to the performer must be guarded as diligently as an individual's valued private property. Two institutions reflect this need:

- The *prop manager*, *prop master*, or *prop-person*, whose sole or overriding responsibility is being sure performers get their props. (The manager of prop weapons and in some cases real weapons serving as props, is often a separate person, and is, in any case, technically the armorer.)
- The prop table, where nothing but props may be left, and nothing removed except by the prop manager or the performer to whom the prop is assigned.

Design, construct and acquire

Under normal circumstances the theatrical prop used must be built, bought, borrowed or pulled from existing stock. This generally falls under the responsibility of the property designer, coordinator or director. Usually the head of the theatre property department, this position requires artistic as well as organizational skills. Working in coordination with the set designer, costume designer, lighting and sometimes, sound designer, this overlapping position has only in recent years become of greater importance. Props have become more and more specialized due in large part to realism as well as the rise of theatre in the round, where few sets are used and the simple prop becomes as important a design element as costumes and lighting.

Besides the obvious artistic creations made in the prop workshop, much of the work done by the property designer is research, phone searches, and general footwork in finding needed items.

Of all the positions within theatre, the property designer receives the least accolades. There are no awards for the props position besides the satisfaction of the item working well for the performance.

Fan-made

One recent trend is prop replica collecting, that is, to fabricate and collect reproductions of props seen in movies, TV shows and video games. Here the enthusiasm for theatrical property is set to its maximum in terms of passion and devotion to get a 100% accurate replica to the screen-used original.

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See also

- Weta Workshop

Technical rehearsal

The **technical rehearsal** or **tech rehearsal** is a rehearsal that focuses on the technological aspects of the performance, in theatrical, musical, and filmed entertainment.

Types of tech rehearsals

Tech rehearsals generally are broken down into two types: dry tech rehearsals and tech rehearsals. Both consist of fully testing out all of the technology being used in the performance (lighting, sound, machinery, special effects, etc.) to diagnose and prevent mistakes from occurring during the actual performance. It also gives the designers the opportunity to see how their designs will impact each other (i.e. how the color of a light might affect the look of a costume), and to make final changes.

Dry tech

The dry tech is essentially a rehearsal without the performers. It is a period, usually lasting multiple hours, where each designer and department head runs his or her segment of the production. It is also a chance for the tech crew who will operate the equipment to become familiar with the flow of the performance. Usually it consists of the lights being cued in sequential order, fixing any problems along the way such as brightness, angle, framing, or position.

Then a sound check is initiated to check the levels of the music, sound effects, or microphones to be used during the performance. Changes are made as necessary to correct volume, pitch, or feedback problems.

Lastly, for stage shows, the fly rigs or battens are tested for weight and accuracy of cueing with sound and lights. If there are moving set pieces, the crew will test their operation and mechanics (if they are automated) and practice their movement, flow, and position on and offstage.

There may be an extra step for particularly effect-intensive productions, such as film, TV, or Broadway-style stage shows, where the crew tests any special effects that require systems such as rain, fire, or explosions. When these effects are completed to the director's and production designer's satisfaction, the crew is ready to move onto the tech.

Tech

The tech rehearsal includes the performers. It runs through the entire production, either in its entirety or cue-to-cue. A cue-to-cue is when the sound and lights are run with certain parts of scenes within the production. Usually a scene will start with the first few lines and then skip to the lines and staged blocking for the next cue. This whole process can take many hours, and though it is beneficial for all aspects of production, it can become very tedious. They have been known to run long hours, mainly due to multiple runs of the show within the tech.

Often included in the tech are the final show props. These props differ from rehearsal props because they are not just placeholders, they are the props to be used in the actual production. This is so that a performer can become acquainted with the true prop before the actual performance so as not to look awkward when using it. It is also to test the durability of the final prop, as well as how the props will look under the final stage lighting.

Costumes are usually reserved for the dress rehearsals, but sometimes they are brought in to test the costumes against the final stage lighting as well, so as not to produce a conflict in color differentiation in the final product. Also, costume pieces that restrict movement or fit strangely such as shoes, hats, gloves and so on may be added either in their final form or (usually) in rehearsal form approximating size, shape, etc. to allow actors to get used to them in advance. Sometimes actors will get dressed in costume for the first time and come on stage so the production staff can see the costumes in their finished form for the first time under stage lighting. This is called a costume parade.

During the tech, all of the previous actions taken during the dry tech are repeated, so as to check lighting in concordance with the staged blocking and stage placement (for example, finding whether the performer is in the light hotspot or not, or how the followspot operates), check the levels on the performers' microphones (if used) and how well the performers can project if orating concurrently with sound or music, allow the performers to know when there are incoming flying rigs, allow performers to experience and become accustomed to the special effects that will occur so that it will not interfere with the actual performance and generally make sure the director and designers are happy with all aspects of the production that can be seen or heard. One very significant effect that is added in tech is blood. This allows actors to get used to it and the costume designer to see how the blood will affect the costumes.

Once completed as many times as the director feels comfortable, the tech will end. Any number of actions can usually be taken after a tech such as the running of problematic scenes or acts, another dry tech to work out problematic technical issues, or certain performers may be held to work with certain effects that the other performers aren't needed for. After all this is completed, the tech rehearsal is officially over, and the next rehearsal to be performed is the dress rehearsal, then final dress.

Pick-up tech rehearsals

Occasionally, if productions run for long periods or if performers are away from the production for prolonged periods, pick-up tech rehearsals are scheduled. Pick-ups usually consist of covering problem areas from previous shows, rehearsing difficult effects or transitions, or rehearsing newly-introduced technical aspects. Usually lasting no longer than a few hours, they sometimes will be held on different days or times as performance pick-ups so as not to bog down the performers or to detract from the performing rehearsal aspect of the show.

If the show is on tour, additional tech rehearsals may be held to cover issues that might arise from being in a different size/shape performance space. Issues might include: set size, timing, lighting angles and intensity, offstage storage, etc. Due to the fast paced nature of tours, often there is very little or no time for additional tech rehearsals.

Technical rehearsals may run in a different order than indicated above, or possibly include other production departments, such as sets, CGI effects, or even costumes.

Paper Tech

Prior to getting into the theater, each of the designers (lighting, sound, scenic, and costumes) will meet with the stage manager to discuss lighting and sound cues, costume changes and movement of the scenery. This process is called paper tech because all of the technical aspects are written down on paper. The stage manager will place all of this information into the prompt book.

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