

COMPETENCIES

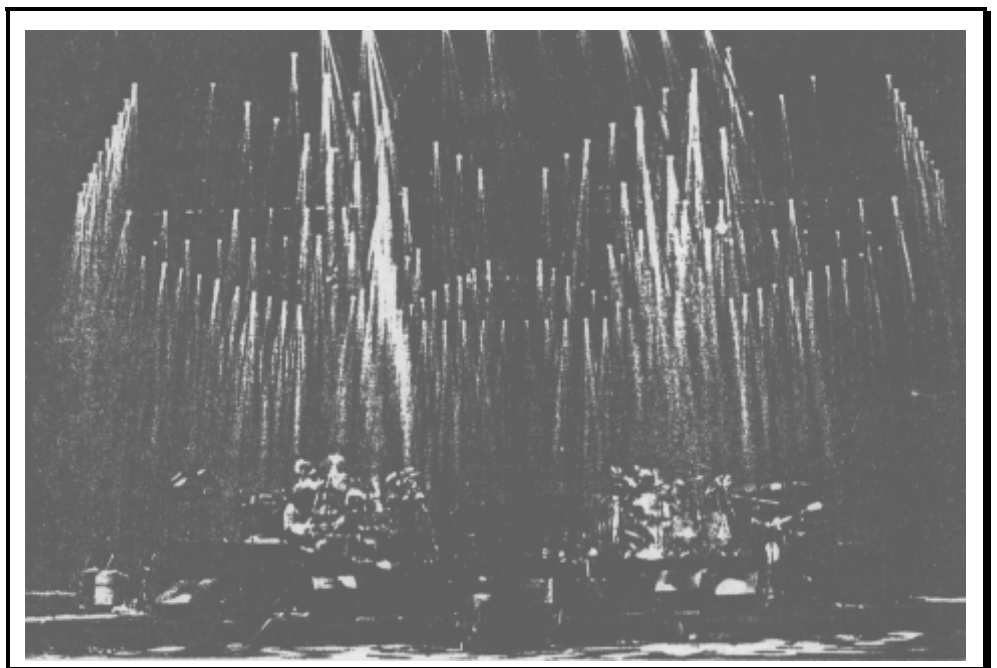
- History and development of concert lighting
- Suspension Systems
- Power systems
- Intensity Control Systems
- Lighting Instruments
- Lighting Design and Plots

History and Development

Concert lighting can be defined as a lighting a performance, usually musical, in a venue that is not specifically designed for that type of particular performance. The performance is usually on a tour of several venues.

Concert lighting is the newest form of performance lighting. Theater lighting was originally developed by the early Greeks and refined as new technology developed. Current theater technology has been developed over the past 100 years--after the advent of the incandescent bulb. Television lighting has paralleled the development of television over the past forty years.

For the past one hundred years, people have been touring with either theater performances on musical shows. They played at opera houses and theaters designed as performance venues. Even though there have been "stars" in this time period such as Frank Sinatra, they



usually performed in theaters. Country music was promoted most effectively by concert touring. They played in school auditoriums across the country. Rock and Roll developed in the late 1950's. They followed the lead of the country performers by going on the road.

Concert lighting is in its infancy. The development of concert lighting has paralleled the development of sound reinforcement. Country performer, Hank Thompson, was the first singer to develop a "portable sound system" that he could take with the band.

Two other factors have influenced the development of concert lighting. Rock and Roll concerts were not welcome in most theaters because of the potentially destructive fans. The only places available were venues designed for athletic events. Usually the only lighting available was directly overhead.

The other factor that influenced the development of concert lighting was the creation of the "mega star". Elvis, the Beatles and later heavy metal groups became so popular that they could quickly sell-out a basketball arena and even football stadiums and baseball parks.

With a stage constructed over third base, the performers were hard to see when conventional stage lighting was used. The largest follow-spots had to be placed on towers near the stage to become effective.

When gross ticket sales reached over \$100,000 at each performance monies became available for more sophisticated lighting and staging.

As touring concerts vied for the audience dollars, each group tried to out do its competition. The music almost became secondary to the staging, costuming and lighting.

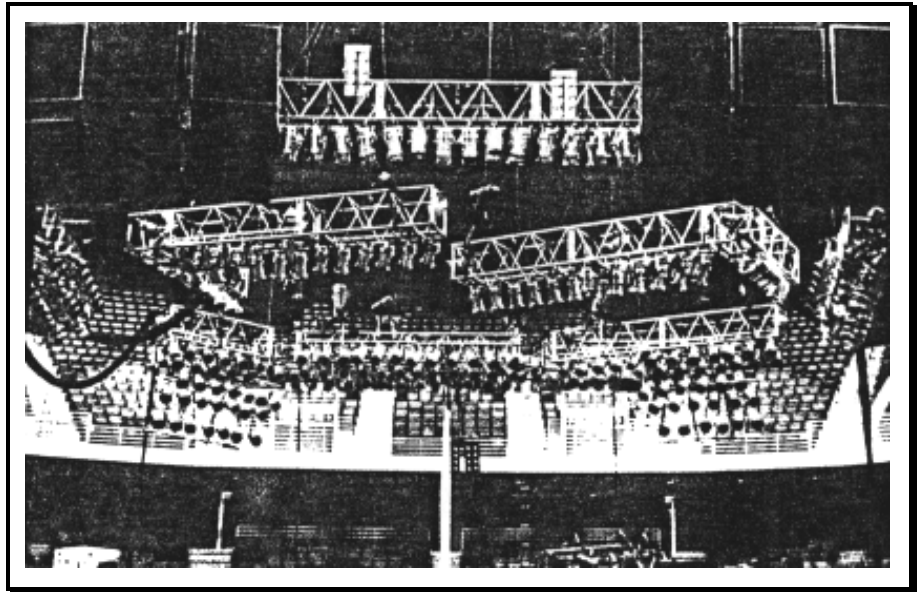
Concert lighting has developed from theater lighting, with the greatest differences being in the use of vivid colors, heavy use of back light, and use of follow spots instead of cross lighting. Specific equipment developments include portable lighting structures, the PAR-64 instrument and computerized moving lights.

Suspension Systems

As acts moved from venue to venue, there developed a need for consistency in placement of lighting instruments. Arena railings and ceiling supports were used initially and lighting placement changed with each performance.

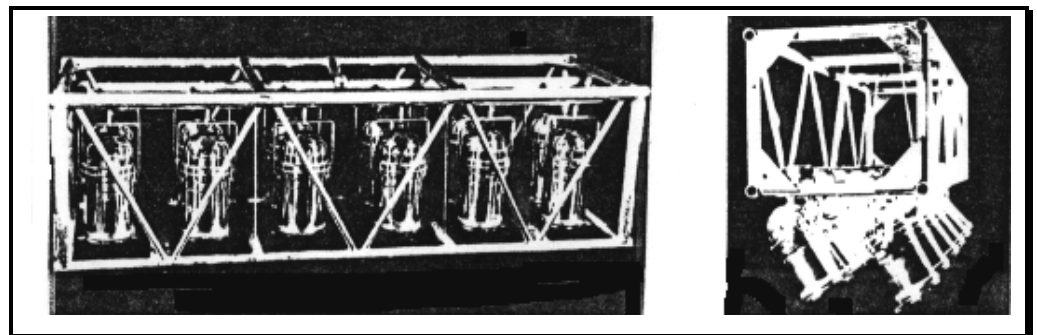
In the early 1970's, the first truss system was used on a Rolling Stones tour. The first truss was adapted from a triangular broadcast tower. The biggest problem was that the tower was designed for vertical stress and when it was placed horizontally, it tended to sag.

Trusses for concert use have been designed for horizontal stress and are made of lightweight aluminum. Initially, instruments were hung and removed for each performance. New designs with square or box configurations are designed to store the instruments for travel and quickly extend below the truss during the performance. The trusses also contain a multi-conductor wiring harness and can also be used to hang drapery and sound systems. Because of the striking design of truss systems or grids, they have become an important part of many of the stage settings. The biggest advantage of using a grid is the labor involved in the setup and tear down of the system.

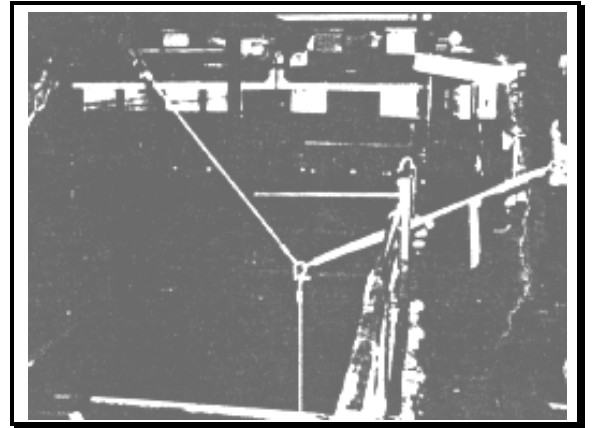


In enclosed venues, grids are suspended from the floor by cables hung from ceiling members and raised and lowered with electrically operated chain hoists. Placement of the trusses is drawn on the floor. Riggers climb to the top of the building and hang the chain hoists over these spots. A floor rigger usually assists them.

Because a hanging truss has the potential of causing massive damage and even death should it fall, careful consideration should be given to the load-bearing capacity of the ceiling members, the connecting cables, chain hoist, and the truss itself.

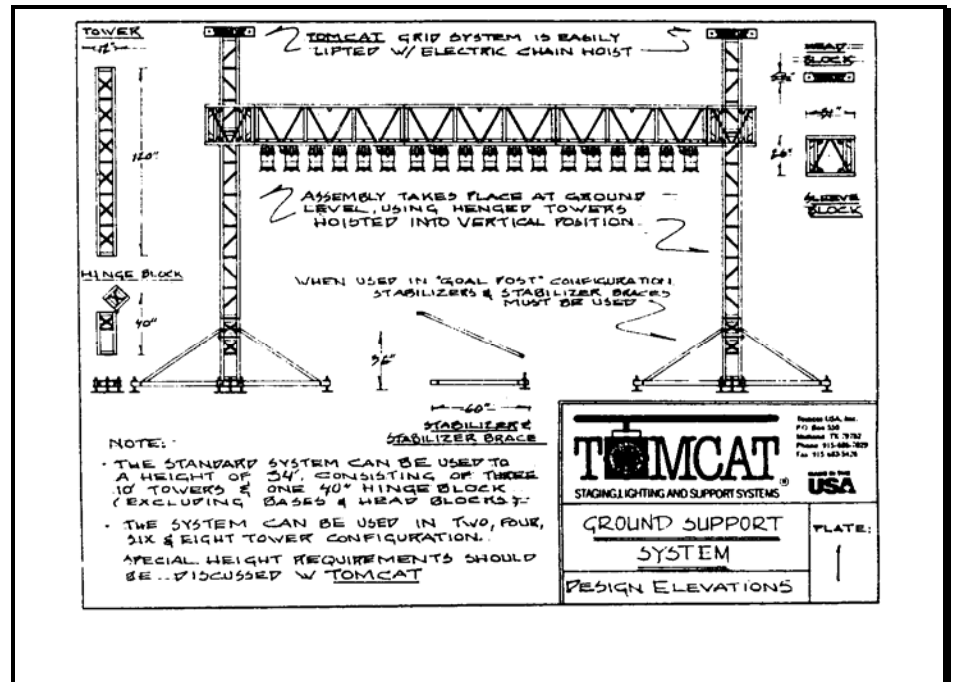


Trusses are attached to the ceiling with a minimum of two suspension points. This makes a stable truss that will not tilt or swing. Usually, the ceiling members are not exactly over the spot where the truss should hang. Bridles are attached to other ceiling members so that the cable will hang over the desired spot. When bridles are used, the capacity of the bridle material is reduced as the angle of the intersection at the hanging point is increased. The same is true if a bridle is used below the chain hoist to balance the truss. When trusses are raised, care should be taken that they remain level when they are being raised. A basic knowledge of geometry and trigonometry is very helpful in hanging truss systems.



In open-air venues, there is nothing to hang a truss from. Large cranes have been used, but they are rented by the hour and are very expensive. A ground-supported truss system must be used. Air and hydraulic lifts are used most frequently. They are telescoping devices and provide a good vertical support, but very little lateral help. They should be placed on a level surface and must be guyed, which adds to the clutter around the lift. Towers, or vertical trusses, have also been used. They are usually raised after the truss has been assembled and the chain hoist is placed inside the tower. A heavy platform at the base of the tower adds lateral support.

Suspended trusses have proven most successful where they can be used. Ground supports ruin sight lines and are easy to turn over.



Power Systems

Most venues, over the years, have installed adequate power supplies. Local electricians will attach the service to the portable dimmer packs and provide service to the sound system. Each venue is different and each city has its own unique electrical codes. Union electricians usually are required to make the connections.

When laying power cables, never coil the cables because it will act as a transformer and produce heat. Power cables should never be laid parallel to audio cables. This will induce hum. If power and audio cables must cross, they should cross at a 90-degree angle.

Intensity Control Systems

Computer-based intensity control systems used initially in the theater have been adapted for touring. The Light Palette was one of the first to go on the road. The control system between the control and the dimmer pack is in an analog format. The newest format is in the digital mode and can be used to control devices other than dimmers; such as smoke machines, color changers, and computer controlled instruments.

Manual control of the system is essential to most lighting directors. They need to "play" the console with the music. Chase and flash features are also necessary.

The main requirements for touring consoles are weight, size, durability and their ability to control many instruments with minimal effort.

Lighting Instruments

PAR-64 Cans

The PAR-64 can is by far the most used instrument in concert lighting. There is little adjustment available--horizontal and vertical movement. The ellipsoidal beam shape can also be adjusted by rotating the lamp. The PAR lamp is sold in 4 beam formats, from narrow to wide. The "64" designation denotes the width of the lamp in 1/8th inches.

PAR cans are usually hung in sections and most predominately used as backlights. They are also used as side washes and as cross lighting for the front of the stage.

PAR cans can be barndoored but are usually not. Most instruments are gelled. Color changers can also be placed over the front of PAR cans. They can hold up to 24 different colored gels. The gels are placed in a roll and motors scroll the selected gel in front of the instrument. The intensity control device controls color selection. They are used mainly where there are space or power limitations. Recently introduced units are priced less than \$1,000.

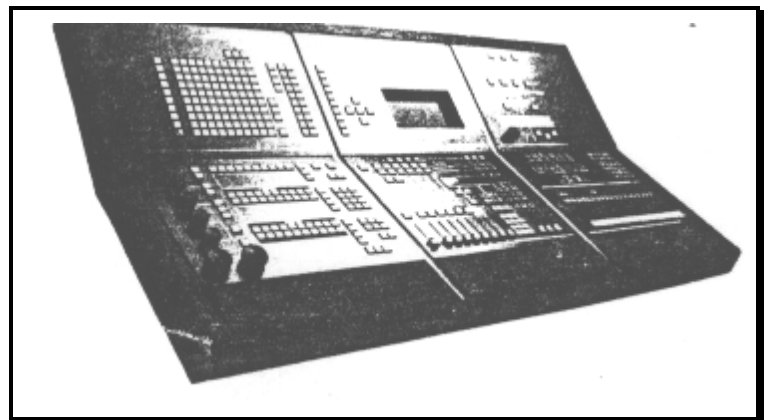
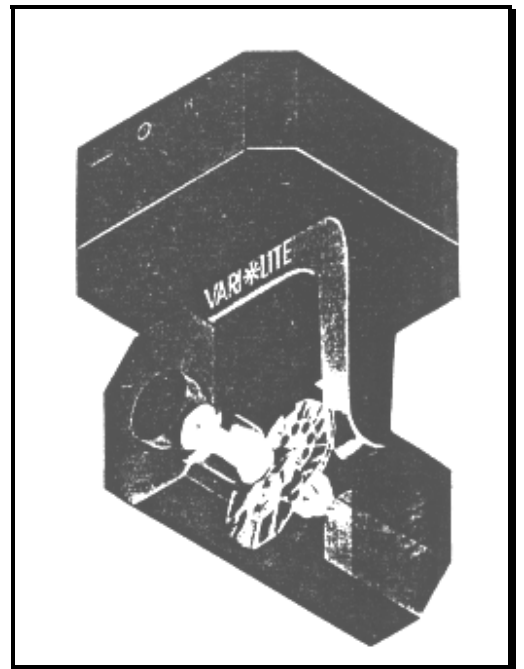
Follow Spots

Follow spots are used to light the stage's focal points. The follow spots are operated manually, with the operator controlling intensity, color and movement. Follow spots are usually placed at the rear of the venue and high enough so that the beam does not wash the whole stage or shine directly into the performers' eyes.

Follow spots are sometimes placed in the truss system with the operator and instrument suspended above the stage. Because the follow spots highlight the subject, any mistake will be immediately obvious to the audience and especially the performer who is paying the operator.

Advanced Technology Lighting Devices

The availability of microprocessors has led to the development of remotely controlled instruments. Motorized yokes with pan-tilt control were manufactured in the 1970's but were not very reliable, especially for touring use. The first major development came from Showco, a Dallas-based sound and staging company. With the financial backing from the group Genesis, they created the Vari*lite company to manufacture and lease the first successful computer-controlled lighting fixture--the 100 Series. Each instrument contains a Motorola 68000 processor and can rotate a full 360 degrees in three seconds. Tilt time is less through a 270-degree range. Two color wheels can provide 120 different colors and can change in less than .1 seconds. Intensity control is infinite and the beam size can quickly go from spot to flood. Focus can also be adjusted. Nine gobos can also be selected. Control of the system is through a custom-designed console. The console can also operate conventional instrument such as PAR cans and smoke machines. Wiring



harnesses and dimmer packs are also custom designed to use the system.

A ten-instrument Vari*lite system leases for around \$20,000 per week plus expenses. High End Systems in Austin was the first manufacturer to sell their instruments and controllers.

Other Instruments

Lasers have been used for about twenty years and have produced some of the most spectacular effects seen on stage. They produce a very defined, pinpoint beam and produce colors that can not be created with conventional instruments. The biggest problem with laser instruments is that they are very delicate and must be operated by trained personnel. Most require a water-cooling system. The laser beam can also be very dangerous, even causing death if operated improperly.

Pyrotechnics are also used to provide light, sound and smoke. Only trained operators should use them and fire codes usually specify minimum standards.

Lighting Design

Essential Elements

Lighting is an integral part of touring concerts. It is not hidden but is vital part of the production. It enhances the visual experience and emotional impact of the show. The lighting should be in harmony with music, staging and costumes. Each of these elements must work together.

Color has been the most dramatic element in concert lighting. Quick changes and striking hues have called attention to the lighting. Layering of different hues can create a 3-dimensional effect. Smoke can make the light more visible creating air light.

Color changes can create the effect of movement, but follow spots are much less subtle. They direct your attention immediately to the most important action. Computer-controlled instruments, working in unison can do an even better job controlling the flow from one part of the stage to another.

Light Plots and Cue Sheets

Concert light plots are generally all-inclusive, one-page drawings outlining all the essential information. Exact placement of the grid, follow spots and front-of-the-house equipment must be determined for each venue.

Just as scripts are used to guide the timing of cue changes in the theater and in television, musical scores and lead sheets are used to direct the operator when to change cues.