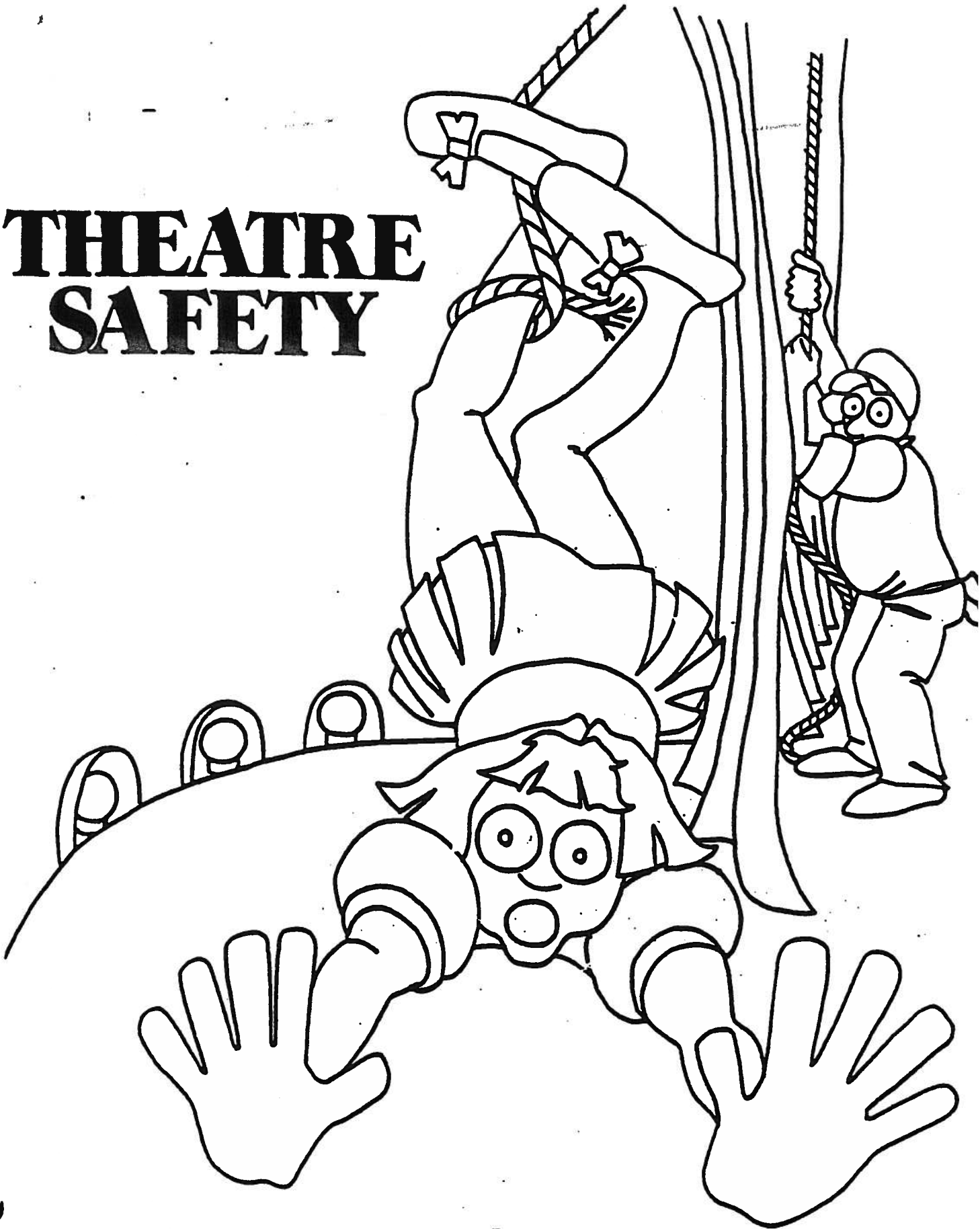


# THEATRE SAFETY



## Introduction

The very nature of theatre involve some special hazards, including safety hazards, fire hazards and chemical hazards. Backstage crew, performers, and sometimes even the audience can be at risk. Within the theatre, there is lifting of heavy scenery, and manipulation of this often large scenery, props, and lighting or special effect equipment in a very small space. The hours of work are irregular and the backstage is often very cramped, especially in older theatres, and there is the pressure that the "show must go on."

Putting on a stage performance involves several steps: preproduction (e.g., set construction, painting of set and scenery, propmaking, costume fabrication, etc.); the production itself; and the "strike" (tearing down the set at the end of the performance run). This article will only discuss safety hazards during the production phase.

Because theatres are so cramped, there is a great potential for general fire hazards such as blocked or locked exits, insufficient exits, or unlabeled exits, unsafe storage of scenery and other combustibles, lack of training in procedures if there is a fire, the use and storage of solvent-based materials such as hair spray, cleaners, or paints, the use of pyrotechnics or open flames, and sometimes a lack of fireproofing on items such as props, curtains, and scenery. For more detailed information on fire hazards in theaters, see the CSA data sheet "Fire Safety in Theaters and Other Performance Spaces", which is available for downloading on the CSA web site (<http://artswire.org:70/1/csa/>). The CSA web site also contains information on preproduction hazards in the theater.

The commonest type of stage is the proscenium stage, a type of end stage theatre in which the backstage and scenery is blocked from audience view by the means of a curtain that effectively masks the backstage activities. (Other types of stages include the thrust stage and theatrical arena, and will not be discussed here.)

There are two worlds of the theatre. One world is the performance, which the audience is privy to. The other world is the backstage world. While the audience can see some aspects of the backstage production (for example, the lights hanging from the lighting grid), for the most part it is hidden from audience view.

One important concept to remember is that the theater has various physical levels. There is the stage itself, where the actors perform. In fact the stage can have several levels besides that of the stage floor, including trap doors, pits, stairs, and balconies. Above the stage is the grid from which lighting, special effects, and scenery is hung. This grid is accessed by stairs or ladders leading to a catwalk. There is also the orchestra pit and the first rows of the audience, which are at a lower level than the

stage. These multiple levels can create hazards of falling or of being hit by items dropped from a higher level.

Before, during and after the production, stagehands prepare the stage for the performance. Activities can include physically adjusting the lights, adjusting lighting levels, moving scenery, arranging and removing props, special effects, and so forth. They work on catwalks located next to the lighting grid, use a variety of types of ladders (fixed ladders, movable ladders, mechanical and hydraulic bucket ladders (tallescopes, Genies). Sometimes scaffolding or platforms are used to access the grid on upper levels of the theatre. Stairs leading to the catwalk and grid are often poorly lit and sometimes without railings. During preparation for performance, there is the danger of falling tools, objects, and even accidents involving workers falling from the grid, catwalk, scaffolds or ladders. In one instance, a college theatre worker breaking his neck from a fall from a Genie lift to the main stage during a focus check. In another a stagehand broke his back when he fell off the stage. Accidents involving falls such as these can occur at any time, including performance.

Rigging is also an important area of concern. Scenery can be flown in vertically and horizontally during performance. Sometimes actors themselves are flown for special scenes. The oldest rigging system is hemp rigging, which uses sandbags as counterweights. There are also counterweight systems that use hemp and wire rope, and deadhung rigging systems, and now commonly remote control electrical winch systems. For detailed information on rigging safety, see the *Stage Rigging Handbook* by Jay O. Glerum.

Currently, many lighting systems are run by computer. However, there is a potential for electrical hazards because of the high power used by many of the lights. Electrical and lighting equipment can be a source of heat and sparks which can create a fire. Examples of electrical and lighting hazards include proximity of hot lamps to combustibles and sprinkler heads, shorting of electrical wiring or equipment, inadequate wiring, deteriorated cables or equipment, fire and health hazards from carbon arcs, and inadequate grounding of equipment. Sections 520 and 530 of the National Electrical Code have detailed guidelines.

During the actual performance, there are also risks to the performers on the stage. These hazards include: tripping or falling on the stage; falls from elevations, into pits, or off the stage; collisions with scenery, props, or other performers; falling scenery, lights, etc. Sometimes, sections of the stage, or even the whole stage can rotate. The greatest hazard occurs when entrances or exits must be done while the stage is rotating. This is not a common hazard but, for example, was problematic in the Broadway show *Starlight Express*, in which performers had to enter and exit a rotating stage while on roller skates.

# Theatre Safety

Safety in the theatre means safeguarding crews, casts, and audiences from all foreseeable hazards and emergencies. Learning to work safely is a vital aspect of educational theatre. Most accidents can be avoided by replacing unsafe habits with safe practices. The main causes of accidents are:

- insufficient knowledge †
- improper use of tools and facilities †
- failure to safeguard hazardous equipment †
- failure to remove faulty equipment †
- carelessness †
- taking unnecessary risks †
- being in a hurry †

The most dangerous time of a production is the strike—when the show is over and the technical elements are dismantled and stored. This time of exhilaration and exhaustion warrants a greater degree of attention and vigilance than any other period in the course of the production.

## General Safety Regulations

- Running, practical jokes, throwing tools or materials, jumping from one level to another, or any other dangerous activity is not permitted.
- The proper method of bending the knees, keeping the body erect, and pushing upward with the legs should be used when lifting objects. Assistance should be obtained when lifting or carrying heavy objects.
- The shop, stagehouse, or other work area must be cleaned and left in a safe condition. All tools should be returned, floors cleaned (using a vacuum or wet mop rather than dusting and sweeping), trash emptied, and walkways and exits left clear and unobstructed. In short, any potential safety or fire hazard must be eliminated.
- Open traps and unusable platforms or step units must be barricaded (fenced or roped off) or covered. They should be marked with large signs at all times between work periods or performances.
- Cleanliness and order in the storage areas should be maintained at all times.
- Any accident should be reported immediately to the supervising teacher so that first aid and/or medical attention can be administered without delay.

## Clothing and Personal Protective Equipment

- Hard sole shoes should be worn while working in the scene shop. Tennis shoes are not desirable; sandals and bare feet should not be permitted.
- Loose-fitting clothing, scarves, ties, or jewelry should not be worn while using power equipment. Long hair should be tied back or covered. Long sleeve shirts should be either buttoned at the cuffs or rolled to the upper arm.
- Goggles, face shields, or safety glasses—all rated for impact—should be worn while using power tools and equipment.
- Ear muffs should be worn during prolonged exposure to excessive noise.
- Gloves should be worn to protect against abrasion and solvents.
- Hard hats should be worn while scenery or lighting equipment is being rigged.
- Wear special work clothes which can be removed after work. Wash clothes frequently and separately from regular clothing.
- Wash hands in soap and water during work breaks, before eating, and after work. Never use solvents to clean hands.

## Fire Protection

- Theatrical fires can be divided into three categories:
  - Class "A"—fire involving ordinary combustibles such as paper, cloth, cardboard, and wood
  - Class "B"—fire involving petroleum base products such as paint, oil, grease, and fuel
  - Class "C"—electrical fire
- Proper procedures for evacuation should be discussed and rehearsed.
- Exits and access to exits must be kept clear and unobstructed at all times. During periods of occupancy, no exit door should be locked, chained, or obstructed by any means. The door must be readily opened from the inside.
- "ABC" fire extinguishers must be well maintained and unobstructed at all times. Students should be trained in their use.
- Flammables such as paint, thinner, and spray cans should be stored in special metal storage cabinets. All rags or clothing materials saturated with flammable paints or solvents should be properly discarded outside of the building.
- Open flames on stage should be avoided if possible. Adequate enclosure and safeguards must be provided if open flames are used.
- Electric light bulbs must not be covered or decorated with paper or other combustible material.

**Nay, then, this spark will prove a raging fire,  
If wind and fuel be brought to feed it with.**

**Queen Margaret, HENRY THE SIXTH, PART II**

The special emphasis placed on fire protection within the theatre is a direct result of two disasters that occurred in this country several decades ago.

The first tragedy of major proportions involved the Brooklyn Theatre in New York on December 5, 1876, where 295 people perished as a result of a fire and its attendant panic. During the final act of "The Two Orphans," a canvas backdrop broke from its fastenings and dangled over an oil lamp along the border of the stage. The canvas caught fire which spread rapidly when it was raised too fast and was further fanned by a roof ventilator. The inadequacy of exits and the wholesale panic which took place accounted for the large loss of life.

Some 25 years later, the worst theatre fire in the history of the American stage occurred in Chicago when the Iroquois Theatre burned on the night of December 30, 1903. The Iroquois, billed as "Absolutely Fireproof," had been open only five weeks prior to the fire started by a combustible stage drape coming into close contact with a powerful spotlight. Comedian Eddie Foy gained a lasting reputation for his coolness and courage in trying to prevent a panic in the over-capacity audience. The initial calm was instantly shattered when the fire-engulfed drapery and props suddenly crashed to the stage, sending flames into the audience under the asbestos curtain which had been only partially lowered. A simultaneous failure of all lights within the theatre threw the crowd into uncontrolled panic. As a result, 602 people died.

These two events led to modern emphasis on emergency preparedness, automatic sprinkler protection, audience limits, exits and exit lighting, panic bars on outward opening doors, and fire fighting equipment in theatres throughout America.

## **Ladders**

- Before any ladder or scaffolding is used, it should be inspected to assure that it is in safe condition. A chair or box should never be substituted for a small ladder.
- Wood ladders should not be painted inasmuch as paint hides splits and defects (shellac or varnish are acceptable alternatives).
- Nonskid safety feet should be installed on any straight ladder before it is placed in service. Guard rails should be used on scaffolding.
- The base of a straight ladder should rest on a level surface and should be placed so that the distance away from the wall or surface against which it leans is approximately one quarter the length of the ladder.
- Straight ladders should be tied off, blocked, or otherwise secured when in use. Or, an assistant should support the ladder against accidental slipping or sliding.

- A step ladder should always be completely opened and climbed only on the side with the steps. Never stand or work from the top of a step ladder.
- Tools or other objects should be secured against falling while work is being performed from a ladder. Such items should never be left on a ladder, dropped, or pitched to another worker.
- After use, ladders should be returned to proper storage.

## **Tools and Machinery**

- Keep the work area free of clutter.
- Know the location of the master electrical switch in the scene shop.
- Before operating machinery or power tools for the first time, be checked out on proper operation procedures by the supervising teacher.
- Dress properly. Wear hard sole shoes, avoid loose clothing, and cover or tie long hair that could catch in moving parts or air vents.
- Use safety eye or face protection. Wear safety glasses with side shields, impact goggles, full face shields, or masks/respirators as indicated by the nature of the work being performed.
- Do not use any defective or questionable electrical tool, machine, cord, connection, or accessory. Report any defects for repair or replacement immediately.
- Understand the application, limitations, and potential hazards of any tool or machine you use.
- Select the proper tool for the job to be done. Don't improvise.
- Use only recommended accessories. Keep guards in place and in working order.
- Make sure saw blades, drill bits, etc., are sharp, clean, and regularly maintained.
- All saws should be adjusted before use to expose only the minimum amount of blade necessary. The fingers and hands must be kept clear of the blade at all times.
- The blade in the table saw should be recessed when not in use.
- Do not use a tool with a frayed cord or broken connection. Use only heavy duty U.L.-listed extension cords of proper wire size and length.
- Electrical lines running along the stage floor should be taped or otherwise secured to prevent tripping during work periods, rehearsals, and performances.
- Use clamps or a vise to hold work in place when practical, freeing both hands to operate the tool.
- Avoid accidental startup. Make sure the switch is "off" before plugging in the cord or when power is interrupted. Never carry a power tool with your finger on the switch.
- Ground all power tools. If a tool is equipped with a three-prong plug, it should be plugged into a three-hole electrical outlet.

- Remove adjusting keys and wrenches before turning on a tool or machine.
- Do not force tools.
- Do not over-reach. Maintain proper footing, balance, and a secure grip on the tool you are using.
- Never adjust or change bits, blades, or belts with the power tool or machine connected to an electrical outlet.
- Never brush away chips or sawdust while tools or machines are operating.
- Never leave tools or equipment running unattended. Disconnect equipment from the power source when not in use.
- Never surprise, touch, or talk to anyone operating a power tool or machinery.
- Return tools to the tool room immediately after completing work.

## **Rigging**

*(Applicable to stages equipped with a counterweight or hemp system)*

- Only authorized and trained personnel are permitted to work with the rigging equipment and to enter the grid area above the stage.
- Safety procedures should be explained to the entire crew at the beginning of each work period involving rigging.
- Work should be arranged so that all rigging and flying are done together, with no other work taking place on stage.
- When a scenic piece is coming in, or when an arbor is being loaded or unloaded, there should be complete silence on stage.
- The technical director or crew head should be the only person to call instructions to the grid crew. The director should inform both the grid and stage crew before a batten or piece is pulled in or out.
- The correct call to warn of a batten, scenery, or line coming in under control is "Heads up!" The emergency call for falling objects is, "Clear the stage!"
- Pockets should be emptied before going on to the grid. Tools brought onto the grid must be tied or secured to the worker. Safety belts should be worn while working on the grid.
- Tools or hardware must never be left loose on the grid.
- Ropes or electrical lines must never be dropped to the stage floor from the grid. They should be pulled up, coiled, and carried down.
- Any discovered irregularity in cable, rope, or the counterweight system should be reported immediately to the supervising teacher.
- Before loading or unloading an arbor, the grid worker must call out, "Clear the rail!" This call is a warning that everyone must clear the area of the stage adjacent to the locking rail. When this area is clear, someone on stage must call out, "Rail clear!" Only after this has been done should the grid worker begin

- loading or unloading the arbor. It is then the responsibility of the stage worker who gave the "Rail clear" call to keep the rail area vacant.
- When hanging scenery or lighting equipment, the load should be attached to the batten before the arbor is loaded. When striking scenery or equipment, the arbor should be unloaded before the load is removed from the batten.
  - A 10-pound weight should not be put on the top of the stacked weights in an arbor. A 20-pound or heavier weight should be on top.
  - Counterweights not in use on the stage floor or loading platform should be neatly arranged. They should never be stacked above the toe rail height of the loading platform.
  - When loading or unloading is complete, the grid worker should call out, "Rail is safe!" This call should be acknowledged from the stage.
  - A counterweight set must be left in a balanced position. This means it should neither be "batten-heavy" nor "arbor-heavy" beyond the control of a single operator.
  - Except for the actual moment of flying, every counterweight set should be kept locked off with the locking rings in place.
  - Pipe extensions to battens must be securely taped, lashed, or wedged into the batten. There should always be at least three feet of pipe extension inside the batten. Long weight-bearing extensions must be bridled to the batten.
  - When rigging pipes, battens and other flying pieces with a rope, secure the piece with a clove hitch finished with a half hitch and tape.
  - Stagehouse rigging must be checked and approved by the faculty supervisor before use.
  - When not in use, every batten should be stripped of hardware, extensions, hemp, or other attachments.

## Lighting

- Only authorized and trained personnel are permitted to work with lighting circuitry, dimmers, and instruments.
- Know the location of the master electrical switch for the stage lighting equipment.
- Do not work around electrical equipment without shoes on.
- Any electrical or mechanical defect or irregularity must be reported to the supervising teacher for correction. No repair of faulty equipment or instruments should be undertaken unless the supervisor has been consulted and approved corrective repair or maintenance.
- Even when disconnected, some electrical equipment can cause shocks. Never remove the cover of a device without assessing the potential danger.
- Should an electrical shock occur, the source of power must be shut off immediately and artificial respiration applied if the victim's breathing has been interrupted and stopped.



- Any incidence of electrical shock, no matter how slight, must be reported for immediate correction to the supervising teacher.
- Food or beverages should not be allowed in the light control area.

## **Paint**

- Be aware of potentially toxic materials: powdered pigments and dyes, fireproofing chemicals, spray adhesives and glues, solvents, and paint.
- Compare labels and use products that contain the least toxic ingredients. For example, replace turpentine with mineral spirits.
- Use premixed paints rather than dry pigments.
- Use water-based or latex paints rather than oil-based paints and enamels.
- Use products that are in solution rather than in powdered form.
- Avoid aerosol cans and spray products.
- Choose brushing and dipping methods in applying paint over spray methods whenever possible.
- Avoid breathing vapors, and use proper ventilation when painting. General dilution ventilation can be used with acrylic, latex, and artist's oils. Spray painting requires exhaust ventilation.
- Avoid skin contact with pigments, paints, and solvents. If contact occurs, wash with waterless hand cleaners and/or soap and water. Never use solvents to clean hands.
- Dispose of solvents and paint-soaked rags in approved self-closing waste disposal cans.
- Store quantities of solvents greater than one quart in approved safety containers. Do not pour solvents down the sink.
- Keep containers of paint, pigments, and solvents closed to prevent the escape of dust or vapors.
- Label all containers as to contents and hazards. Use nonbreakable containers stored on low, easy-to-reach shelves with the label-side to the front.

## **Silk Screen Printing**

- Exhaust ventilation should be used to remove vapors.
- Substitute mineral spirits for lacquer thinner whenever possible.
- Use rubber gloves for cleanup, and place solvent-soaked rags in a covered metal receptacle.

## Makeup

- Never lend or accept makeup from anyone.
- Wash hands before and after applying makeup. Makeup artists should wash their hands before starting on another actor. Sponges and brushes should be washed after use on each individual.
- Avoid aerosol products whenever possible.
- Replace old makeup regularly.
- Avoid creating clouds of face powder that can be inhaled. Do not use old face powder.
- Moisten brushes or pencils with clean tap water, not with saliva.
- When removing spirit gum or latex, avoid prolonged skin contact with solvents. Replace lost skin oils with moisturizer.