

### **BASIC STAGE SAFETY**

Make sure that all props are safely secured.  
All trap doors and pits must be adequately marked.  
All rotating sections of the stage must be marked  
All grooves in the floor must be clearly marked.  
All elevations should be clearly marked and safe, and be made of secure construction.  
Stage floors should have adequate resiliency.  
Stage floors should be kept dry and cleared of slippery materials.  
The stage floors should be free of splinters, nails, or worn-out floorboards.  
Backstage stairs should be maintained in good condition, and the stairwells should be properly lit.  
All alleyways should be clear of litter and obstacles.  
The stairs leading up to any catwalk or elevation should have rails, and be marked.  
People should not be allowed to enter or exit sections of the stage that are moving or rotating unless absolutely necessary.

### **ELEVATED PLATFORMS AND WORKSPACES**

All areas elevated above 6 feet should be guarded by standard railings.  
Guardrails are needed for wall openings that are 30" from the ground.  
All floor openings must be guarded by a cover or guardrail on open sides. If there is only a cover, when uncovered, the opening must be attended to by worker. Hinges, handles, and all other hardware must be flush with the floor.  
If guardrails are impracticable, there should be other mechanisms for preventing falling, such as tape markings.  
Walking on open beams or sliding down beams that are 15 feet high must be done only with safety harnesses.  
People must not ride on lifting devices that aren't meant for human lifting, or on any moving devices such as telescopes.  
Platforms should be clear of all obstructions, and kept free of oils, grease or water.  
Standard railing consist of a toprail, an midrail, toeboard and posts. Standard railings must be able to withstand 200 pounds in any direction on the top rail.  
All guardrails should be designed for live load of 20 pounds per foot.  
For metal pipe railing, the top rails and midrail should be 1 1/2 inch in diameter.  
If toeboards are required, they should not exceed 3 « inches and bottom clearance should not exceed 1/4 inch.  
If work is done on thrustouts or other elevated surfaces of over 15 feet (e.g. trusses or beams), safety belts and lifelines are needed.  
All individuals working under elevations must wear hardhats and safety shoes.

### **SCAFFOLDS**

OSHA has strict regulations for scaffolding (CFR 1910.29 and 1910.29)  
Scaffolds should be erected and dismantled by experienced personnel using the proper equipment.  
Scaffolds should be constructed so they can support up to 4 times the maximum intended load.  
Scaffolds should follow the Ontario 3 to 1 rule, meaning that the maximum height of a free-standing scaffold should be 3 times the narrowest side of the base. OSHA regulations allow a 4 to 1 ratio.  
Scaffolds must never be erected on top of barrels, boxes, cement blocks, or other unstable support.  
Guardrails and toeboards are required on all scaffolds over 8 feet tall. If the scaffold is less than 45 inches wide, then there must be guardrails on scaffolds over 4 feet.  
Rolling scaffolds (towers) must have proper cross and horizontal bracing, and at least two of four casters or wheels must be swivel type with locking capability. People should not be allowed to ride on manually propelled scaffolds.  
Equipment being ferried up and down the scaffolding must be properly secured. All equipment on top must be secured to the main framework.  
All hand tools must be secured to the worker.  
All individuals working under scaffolds must wear hardhats.  
All individuals working under scaffolds should wear safety shoes.

### **LADDERS**

Ladders should always be inspected before use to make sure they are in safe condition. Any ladders with broken or missing rungs or other defects shall not be used.  
Never substitute a chair, table or box etc. for a ladder. Never place a ladder on a table or box to increase the height.  
Ladders should not be "spliced" together to create a longer one.  
All personnel using a ladder should face the ladder while ascending and descending.  
A step ladder should be used only in the completely open position, and only climbed on the side with the steps. A step ladder shouldn't be used as a surface from which to work. Workers should not stand on the top step.  
Use wooden ladders because of increased stability and their non-conducting properties. The ladders should not be painted (this can hide splits and defects).  
Ladders should be maintained in good condition, the hardware and fittings, and joints should be securely and smoothly operating. Rungs should be clean of oil, grease or water.  
The ladder feet should be placed on a secure base, and the area underneath the ladder should be kept clear of debris and dry.  
Non-skid safety feet should be installed on all straight ladders before use.  
Manufactured portable wood ladders should have non-slip bases securely bolted or riveted by side rails.  
Ladder siderails shall at least 3 feet above the landing. If this is not possible, then there should be grab rail installed.  
Portable metal ladders should not be used for electrical work. Metal ladders must be marked: "CAUTION: Do Not Use Around Electrical Equipment."  
Straight ladders should be kept on a level surface. They should be placed so that the distance from the wall or surface upon which it leans is about one quarter the length of the ladder.  
Straight ladders should be blocked, tied off or otherwise secured when in use. Otherwise, an assistant wearing a hard hat should brace the ladders for the user. For large ladders, two assistants may be needed.  
Tools and other objects should be secured against falling while using the ladder. Materials should never be left on the ladder, or dropped or pitched to another worker.  
Telescopes, genies, other hydraulic lift systems and other bucket ladders can only be operated if all outriggers are in place. If the telescope is located directly on the wall, then that side can be without the outrigger, provided the wheels are locked and the rig stabilized.  
Fixed ladders over 20 feet in height must be caged.  
If there are ladder safety devices, then a landing platform is not required. Examples of these are a wire rope going along the middle of the ladder, or a notched rail device used in conjunction with a friction operated safety harness.  
Because a fixed ladder rests on a wall, these ladders can be installed at a steeper angle than portable ladders.

## **RIGGING**

The operation, maintenance, and repair work on rigging equipment should be done by properly trained and qualified persons. They should be knowledgeable in operation and functioning of the equipment, safe use, routine maintenance, operation of safety devices, possible dangers during proper and improper operation, and emergency procedures.

All rigging equipment shall be inspected before use, after alterations, and at regular intervals.

Counterweights should be enclosed with a guard preventing passage underneath. The guards must be secured in place.

Damaged or defective slings and ropes must be removed from service. Chains or ropes should not be shortened by knotting.

Be sure all loads do not exceed the safe capacity of the system.

Follow safe procedures when loading, unloading, or operating rigging systems. Unbalanced counterweight systems should be kept on the ground, for example while loading and unloading.

Maintain visual contact with a moving piece at all times.

Warn people on the stage and grid before moving any rigged scenery or other object.

Maintain control of all moving pieces at all times.

Only assigned personnel shall have access to suspended work areas such as grids and catwalks.

All hoisting systems should be secured to prevent accidental or unauthorized use.

## **ELECTRICAL SYSTEM**

All electrical work and wiring should be done in accordance with requirements of the National Electrical Code by licensed electricians. Only members of the electrical crew should make electrical connections to distribution boxes.

All electrical cables should use standard color coding: white - neutral; green - case or earth grounding; red, black and blue - live or hot wire; brown, yellow and orange -high voltage.

All electrical personnel should be aware of the load-bearing capacity of cables and boxes and not overload this capacity.

Cables should be routed, taped down or covered to avoid people tripping over them. They should not be nailed, stapled, or tacked to wood or attached to metal pipes or other metal materials.

Cables should not be spliced; they should be connected to approved terminals or connectors.

Cables should be checked regularly for overheating, loose connections, fraying or other damage.

Extension cords used with portable electric tools should be three-wire type.

Worn and frayed electrical cables should not be used. Keep electric cables away from sharp corners or doors that can pinch and injure them.

Flexible cords should not be substituted for fixed wiring.

Scenery brackets should be wired internally, and the fixture stem should reach through the back of the scenery where a bushing should be placed on the end of the stem. All fixtures should be securely fastened in place.

Portable stage switchboards must be supplied by outlets of sufficient voltage and ampere ratings.

All circuits from a portable switchboard shall be provided with suitable overcurrent protection.

Portable switchboards shall be enclosed with substantial construction that is lined with corrosion resistant metal. All switches and circuit breakers should be externally operable and enclosed.

Portable switchboards must have a pilot light that is lit even when the master switch is opened.

Electrical devices used for special effects ( e.g., simulating lightning, waterfalls etc.) must be constructed so that sparks and flames do not contact any combustibles.

All AC circuits must be grounded.

The path to ground from all circuits, enclosures, and equipment shall be permanent. All switches shall be marked.

Powered tools and electrical equipment with exposed metal parts must be grounded.

If equipment is de-energized for any reason (for example maintenance or repair) then the equipment should be so locked-out and tagged-out. For information on lock-out and tag-out procedures, see the "Lockout/Tagout" article on page 2 of this issue of Art Hazards News.

Temporary lights must be equipped with guards to prevent contact with the bulb.

Backfeeding of circuits is prohibited.

Electrical outlets should be recessed.

## **LIGHTS**

All lights must be safely secured.

All lights and other powered equipment should be properly grounded.

Deteriorated or poorly maintained lighting equipment fixtures, sockets, fixture wiring, etc. should be replaced.

Fixtures should be turned off and disconnected from the power source before being worked on.

Equipment repaired at the theatre should be checked for continuity and polarity before reuse.

All lighting fixtures or stands should be properly supported to prevent tipping. Hung fixtures should have a safety chain or bond.

Install ground fault circuit interrupters (for AC), when using powered equipment within 6 feet of the possibility of water splashing.

Open-faced equipment should have shielding to protect nearby personnel from flying glass in case of an exploding bulb.

High voltage gas discharge lamps - such as neons, HMIs, CSIs and fluorescents - should be properly grounded, inspected for lens cracks that could leak ultraviolet radiation, and otherwise handled with the care given high voltage equipment. Personnel using them should be aware of the ballasts used and ensure all micro safety devices are working. Keep people away before striking the lamp.

All personnel should be warned of the dangers of ultraviolet radiation from "arc" type lamps, and care taken to protect against skin and eye damage.

Stage lights should be properly focussed, angled and located.

There should be adequate lighting backstage.

Lasers must meet requirements set forth by the relevant authority. Only those personnel with correct laser-operation permits are allowed to operate lasers.

Black light output should be low in ultraviolet radiation.

## **FIRE SAFETY**

There should be written emergency procedures.

There should be routinely scheduled fire drills.

Emergency exits should be clearly marked and accessible.

There should be a functional sprinkler system.

There should be appropriate fire extinguishers, in good condition and checked regularly. There should be adequate training for their use.

There should be a working fire alarm and smoke alarm system.

All curtains, props, sets, and scenery should be fireproof. Costumes should be fireproof if there are any fire effects.

If extensive pyrotechnics are used, there should be fireguards or firefighters present at each performance.

Combustibles, waste materials and rubbish should be stored in approved containers or disposed of properly.

Oily rags, paint rags, oily waste, or similar materials subject to spontaneous combustion should be kept in approved oily waste cans and emptied daily.

Keep stored combustible materials away from exits and fire equipment.