CHAPTER THREE

SAFETY

A stage and auditorium are points of concern to most fire departments, fire inspectors, and insurance underwriters. The auditorium is a gathering point for a large group of people, most of whom will be in less than familiar surroundings. The stage is not usually on the daily route of the building cleaning staff and, due to the uses of the stage, dust, dirt, debris, and small items from previous productions will gather.

The scenery shop, costume spaces, props areas, and the stage itself also present possible locations for personal injury due to the nature of the work done, materials and equipment handled, and the fact that the individuals involved are not always totally familiar with them.

While not all the materials used on stage and in the shops are flammable they lend a less-than-neat appearance and will cause the casual observer to feel that the area is unsafe. The area may well be unsafe since many use this situation as an excuse for having a messy stage.

FIRE SAFETY

By nature of the area a stage is prone to collect dust, and dust in great quantity in the air does contribute to possible fire. It settles on curtains, scenery, the floor, and can thus contribute to the deterioration of the *flameproofing*, if flameproofing has been used. Any stage using manila rope at any point in the rigging produces a problem in the flaking off of bits of manila or hemp as the rope is used. If these flakes are allowed to pile up under the lock or pin rail they produce a tinder pile which can be ignited by a glowing cigarette or a spark.

It is for this reason that smoking on stages is strictly forbidden in most locations. The individual cigarette as it is smoked is not the primary problem. The problem occurs when the unsmoked portion is carelessly discarded without being extinguished.

People also confuse *fireproof* and flameproof. Very few items, if any, are fireproof. Get anything hot enough and it will change form, i.e. burn. Even the nose cones of re-entry vehicles for space exploration have their limitations as to how much heat they can take and for how long.

Flameproofing merely means that in its original state the material was treated so it would resist bursting into flame when brought into contact with a hot item such as a stage lighting instrument. The material will usually char and smoke, but that is all. Age causes deterioration of flameproofing compounds; thus stage curtain manufacturers and scenic houses who treat their scenery are quick to indicate the estimated life of their compound. For the most part, this life is five years on new stage curtains, less on scenery.

To do the job properly a curtain must be re-flameproofed when it is cleaned. Cleaning and re-flameproofing stage curtains is getting to be so expensive that one is better off to look into getting a new curtain. Research is continuing in an attempt to find a flameproofing compound that will stay in the fabric through the cleaning process. There are some curtain fabrics available today which are inherently flameproofed but their visual and esthetic qualities often are not what are desired in stage curtains.

On most stages there are some provisions made for fire safety. These provisions are often ignored or misunderstood. Crew members often do not know where fire safety items are, what they are for, what their limitations are, or how to operate them. There are five types of provisions.

FIRE SAFETY DEVICES

Fire Curtain

Because the stage is a real fire hazard area and since the audience is watching the stage, the first concern is to get the stage separated from the audience. This is done (to comply with local building codes) usually with a fire curtain which is immediately behind the proscenium. For years the fire curtains were made of asbestos.

Due to the concerns over the use of *friable* asbestos many people panic at the thought of its use in a stage curtain. The key here is "friable" which is defined as "easily crumbled." A high percentage of the fire curtains made were sealed one way or another. It has been explained to me that the OSHA concern is for the manufacture of the asbestos curtain (which

was ceased in 1987), not its installation or use. Building codes for the most part now recognize a reinforced fiberglass material which is used as a replacement for these curtains.

A fire curtain is designed to descend automatically in case of high temperature on stage to seal off the proscenium opening and block the vision of the fire. With a fire out of sight there is less reason for panic, and the curtain will hold fire long enough for the audience to leave the hall. Fire curtains vary in form and manufacture, dependent upon the layout of the stage and again, the requirements of the local building codes. Some curtains provide for manual operation which allows the use of the curtain to block the opening before and after a performance, or to provide security for a set and its props while something else is taking place in the house.

Stage Ventilators / Smoke Vents

A second set of fire safety provisions is provided with or without the installation of a fire curtain. These are the stage ventilators, or smoke vents. They are rigged to open automatically at a given heat level. They act just as a damper in a chimney above a fireplace. When the damper is open, the smoke and flame go up and out. If the damper is closed, the smoke and flame go into the house. In case of fire and the closing of the fire curtain the ventilators provide a route of travel for the super-heated air which is responsible for so much damage and for the spread of fire. Some ventilators can be operated manually in addition to the automatic trip. They can be used to release the build-up of hot air in the loft during performances in warm weather when no air conditioning is present.

Fire Extinguishers

A third type of fire safety device is the fire extinguisher. It is a visually familiar item and is often seen around buildings. Unfortunately, relatively few people know how or when to use one.

Fire extinguishers are devices of limited use and, to be most effective, call for knowledge on the part of the user. Each type of extinguisher is different in method of operation so each person working on a stage should be familiar with the location and exact method of operation of the particular extinguishers in the area. Some must be turned upside down to operate. Others will operate only in the upright position.

Most important is the rating of the extinguisher. The rating will be shown on the extinguisher. Rating indicates the class of fire and relative effectiveness on that fire. *Fire classifications* are: Class A = normal combustibles such as cloth, wood, paper, etc.; Class B = flammable liquids; Class C = electrical equipment. In addition to the letter of class indication, there is a number rating which designates relative effectiveness. The larger the number, the more effective the extinguisher. There is a more detailed chart of basic extinguishers at the end of this chapter.

Soda-Acid extinguishers which still may be found in many schools and public buildings are for use in fighting class A fires. They are similar in looks to *water* filled tanks which have been pressurized with air. Either projects its contents with such pressure that it would spread a burning liquid and, the fluids being conductors of electricity, are not recommended for use on liquid or electrical equipment fires. Water is present in each and would dampen and weight paper, wood, fabric, and the like, so the material would not blow away in the force of the stream.

CO_2 and *dry powder* type extinguishers do not expel liquid. Either the gas expelled by the CO_2 or the powder of the dry type would have a tendency to blow burning bits of material around. Both of these work by forming a "blanket" of gas which forces oxygen away from the flame thus causing it to go out. Neither gas nor dry powder conducts electricity, thus allowing the use of either on electrical fires.

A newer chemical type, a very efficient extinguisher, uses *halon*. It is a more effective material to use in that it works to eliminate the fire faster and cleaner than the others. But it is a more expensive method.

Fire Alarm

A fourth fire safety consideration usually found on a stage is a fire alarm system. Participants should be aware of this system, where its stations are located, and whom it notifies. Some systems simply provide an audible internal building alarm while others alert the local fire department.

In case of fire, summon help first. The first few moments of a fire tell how bad it will be and the longer start it has, the harder it is to fight. Attempting to control a small fire with a hand extinguisher and failing will only encourage the fire with a good start. Firemen would rather get a call on a small fire and arrive to find that after they had been called the flame was extinguished.

Sprinkler System

A fifth method of protection is required in stages and shops by some local codes — this is the automatic sprinkler system. Examples of such systems may be seen in most department stores and other public buildings. They consist of individually activated sprinkler heads which will release a heavy flow of water when the temperature in the immediate area reaches a designated level. Many of these systems also have a built-in alarm which notifies the local fire department when any water flows in the system.

Fire Hoses

Many public buildings also contain wall-mounted fire hoses. These, like fire extinguishers, have limitations. Most of the fire hoses, for instance, must be entirely removed from their racks or reels and the valve manually opened before they can be operated. A kink or fold in the hose can limit its operation, and if there is sufficient pressure to flip this kink out, the moving hose would probably have sufficient power to cause injury to anyone it struck.

Fortunately fire today is relatively uncommon on stages. Better enclosures on lights and better flameproofing materials along with increased awareness on the part of the technicians have each helped. Since a stage is most susceptible to fire, it is a must for the personnel working in the area to be familiar with the equipment at hand, where it is and what it does. Most important is to know what to do in case fire starts. Planning eliminates panic.

EQUIPMENT / MATERIAL SAFETY

Most scene shops have budgets which suggest that they attempt to re-use lumber and lumber by-products. It is extremely important that during strike all materials used have the fasteners completely removed.

Nails, screws and staples cannot be left in lumber. The presence of a nail, part of a screw or, most importantly — a leg of a staple, will easily lacerate flesh often even through gloves or clothing. Fasteners used to secure scenic pieces one to another must be removed so they will not cause damage to adjacent items during storage. Lumber needs to be stored in such a manner that workers can safely take it out of stock, use it and return it. Lumber should not be left where people can step on it. Small bits of lumber can cause twisted ankles, slipping or other injuries.

Metal pieces on concrete floors can provide a situation which causes a reaction similar to slipping on a piece of ice. This is exaggerated when wearing leather-soled shoes. Leather provides little traction on any surface which is why it is not recommended as a shoe sole material for stage crew members.

Ladders need to be checked regularly to make sure that they are safe. According to manufacturers, wood ladders should not be painted. Paint will seal out the moisture needed to keep the wood pliable. Most recommend the application of linseed oil to help lengthen the life of the wood. Also check the rungs and their supports to make sure that they are secure. Ladders carry labels which indicate general safety rules. These should be followed carefully.

Fiberglass ladders have a longer life, are usually lighter in weight, and are recommended for use around electrical equipment since they are constructed of an insulating material. The down side is that they are more expensive.

More sophisticated stages may use pneumatic or electric lifts instead of or in addition to ladders. Each of these presents a new list of concerns. Each lift comes with a manual describing the uses and limitations of that particular lift. When using a lift there should always be a second person in attendance.

Electrical cords and cables must be checked regularly. Connectors must be tight and care taken to check for abrasions or other damage to the outside insulating covering. Any time you find a point in a cable which is warmer than the ambient air you have indication of a problem. This includes connectors. It is strongly recommended that you use heavy duty connectors which have firm cable clamps. They cost a little more, but you will have fewer problems with this type of connector.

Ropes have more limitations than people realize. The Cordage Institute provides a pamphlet indicating a number of concerns about rope use. These concerns apply to both natural and synthetic ropes. Included are notes on: choice of rope; storage and care of rope; removing from coils and reels; handling; overloading; winching, checking for wear; splicing; abrasion and the effects of heat. While the use of rope lines on stages is diminishing you need to be aware of the possible limitations and problems.

Steel cables are the rigging lines of choice today. Lift lines installed today are usually of aircraft cable. These cables have a greater number of individual wires in their configuration therefore are more flexible and stronger.

Ropes and cables have stated limits in working strength and breaking strength. The greatest strain placed on either comes when the line is subjected to a sudden shock load. When this happens the line can snap and recoil causing serious damage to items or injury to personnel nearby. One of the manufacturer's pamphlets on rope says that one should not stand in line with or even near any rope (or cable) under tension. Nylon rope is particularly prone to failure. Any line which fails under tension can recoil with sudden force causing severe injury.

Be aware that if a counterweight set gets away from the operator or starts to move on its own the only safe method of attempting to slow it is by closing the rope lock. Under no circumstances should you grasp the moving line. The result is, at best, a rope burn.

If you must handle steel cable you should be wearing gloves. Often individual strands of the cable will break. The result is very sharp bits of wire protruding from the perimeter of the cable and causing lacerations.

INDIVIDUAL SAFETY — SHOP

A focus of concern is for personal safety. Because tools are being used, pieces of scenery constructed and moved, items perhaps flown or hung overhead, and battens moved up and down, the stage and related areas are a major point of concern for safety.

Production and rehearsal schedules often are hectic but care must be taken to alert all concerned about possible safety concerns during set-up, scene shifts, and strike.

As an overall rule, workers in this area should wear *shoes* with leather uppers not sneakers. Leather will provide MUCH more protection than cloth when something is dropped, a platform rolled over toes, or a board with nails is left where one can step on it or be snagged by it. The soles of the shoes should be composition or rubber since leather provides little traction on concrete or polished wood. Nothing takes the place of care, but we need all the help we can get.

In chapter seven on tools, a number of safety practices are mentioned. Some sort of *eye protection* should be worn while using saws, drills, or even hammers, and while erecting a set or hanging scenery. The tools named can all throw chips and the other work causes the crew members to look up a lot where there is liable to be dust, dirt, or other foreign matter falling. Any time metal is used on or against other metal there is the possibility of slivers being produced. Note that many tools sold today have labels attached warning of the need for eye protection to be worn. You will find these on hammers, screwdrivers and even some wrenches and pliers.

While operating any motor-driven tool regardless of its size, be sure that clothing is secured. Properly fitted *shop coats* not only protect your own clothing; they also provide an additional layer of protection. Loose clothing may become entangled in moving equipment and cause operator injury.

INDIVIDUAL SAFETY — SET-UP / STRIKE

A strict interpretation of the OSHA rules would seem to indicate the use of hard hats for crew members during construction, installation and strike of sets.

Ideally the set-up and strike crews should wear *gloves* to guard against splinters, exposed hardware, or other items likely to cause injury. One of the more common dangers is the protrusion of nails, screws or staples which have not been completely set or totally removed from scenic units.

Rigging system operators should also wear gloves to help eliminate rope splinters and rope burns. Note that a glove will not completely protect the hands from rope burn if you grasp a moving line.

Crews loading in a show need to constantly be aware of their surrounding personnel and equipment in six directions: forward, back, left, right, up and down. Whether moving a ladder, scenery, lighting equipment or just going from one spot to another collision is possible.

Although mentioned in the chapter on rigging the potential dangers of counterweighted rigging need to be reinforced. Battens normally come down to a point about five feet above the floor so personnel on the floor all need to be aware of batten movement. The operators of the lock rail should not be bashful about calling out the number of the pipe being brought in or taken out during work sessions so all are aware of movement.

To load weights, one releases the collars and raises the spreader plate, then weight is **added** to the carriage **after** the batten is loaded. It is **removed** from the carriage **before** the pipe is cleared — or lightened. Even an empty batten is heavy so it has been my practice to make sure that the top weight of the stack required to balance an empty batten is painted red. That reminds the loading crew that it is not to be removed as weight is taken off to balance the empty pipe. When the weight stack is completed the top spreader plate **must** be brought down on top of the top weight and the collars locked in place with the screws provided for that purpose.

MATERIAL SAFETY DATA SHEETS

Society is becoming more aware of the hazards to humans caused by *chemicals*. Individual chemicals can pose problems but the combination of elements can be more dangerous. The worker needs to be aware of the make-up of liquids and powders being used and if unsure of possible danger, get a professional opinion. Danger is present if you inhale fumes. A great quantity of ventilation needs to be provided when spraying paints, mixing compounds for fiberglass or Celastic, or even when applying commercial paints. Of equal concern is chemical burn on the skin or in the eyes. A scene shop can contain as many if not more dangerous chemicals than a chemistry laboratory so care MUST be exercised.

Material safety data sheets are available from the manufacturer of any material or compound which may cause irritation or injury to persons. Copies of these should be present in the shop area and shop personnel need to be made aware of the potential dangers. This includes the use of "spray cans" from which the propellant and/or the actual paint compound can cause irritation.

SAFETY INFORMATION

Many safety monographs, pamphlets, catalogs, videotapes and brochures are available. The United States Institute for Theater Technology (USITT) has a commission on theat