



Department of Theatre Safety Guide

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Introduction

A. Scope

The Normandale Community College Department of Theatre Safety Guide is intended for all theatre productions which use spaces including, but not limited to the main stage theatre F1255 and the black box theatre F1221. Information found in the manual is applicable to all members of the theatre community including directors, performers, crew, stage managers, and front-of-house personnel. Any questions or comments regarding this manual should be directed to the technical theatre faculty or the current Normandale safety liaison.

B. How to Use the Manual

The manual is designed to follow a production from planning stages to strike. It is divided into primary sections such as event planning, emergency procedures, set design & construction, lighting & sound, special effects, cast & crew, performance and strike.

C. Technical Theatre Training

Technical theatre training will occur during the first week of each semester. Technical theatre faculty responsible for supervising the scene shop and/or instructing the Technical Theatre Practicum (THTR 1122) and/or the Introduction to Stagecraft (THTR 1140) courses will be responsible for the training. The training is designed to promote basic shop and technical safety skills for students working on productions. Topics will include a safety overview of personal protective equipment, use of power tools, lighting and basic rigging, ladders, and paints and chemicals. This training is mandatory for all students who wish to work on any technical phases of a production, regardless of previous experience. Each student need only attend one training to be considered fully trained for the remainder of his or her time at Normandale Community College. Students required to complete shop hours for partial credit in Introduction to Theatre (THTR 1116), Introduction to Stage Costumes (THTR 1130), Introduction to Stage Lighting and Sound (THTR 1145), and Basic Design for the Stage (THTR 2020) as well as volunteers will be trained on personal protective equipment, use of power tools, ladders, and paints and chemicals on an as needed basis prior to any work in these areas.



D. Sources of Assistance

1. Technical Theatre Faculty – Technical theatre faculty are the primary source of assistance for any issue related to technical theatre or building maintenance. The faculty is proficient in set design and construction, lighting design, audio engineering, technical direction, and stage management. The technical theatre faculty is always on the premises during technical theatre work and can be otherwise contacted by telephone or email.
2. Building Services – Building Services provides moving services, exterminator services, special trash/recycling pick-ups, janitorial services and maintenance of fire extinguishers and first aid kits. Additionally, Building Services can be called upon for repairs to building systems like electrical wiring, general upkeep, and facilities improvements. Requests for repairs should be made through the technical theatre faculty but can be requested at extension 8110.
3. Security Office – Security personnel are trained in first aid and can also arrange medical transport. In case of any fire, police or medical emergency, call Security at 555 from any campus phone.

Event Planning

A. Organization Recognition

Any official Normandale Community College organization may have access to the theatre facilities dependent upon class and production schedules. Outside organizations that are beneficial to the college may also have access to the theatre facilities but may be charged a rental fee and are also subject to class and production schedules. All events are required to staff a technical theatre faculty member or student employee. Scheduling and approval will be handled by the current technical theatre faculty in charge of facilities.

B. Available Venues

The available facilities are the main stage theatre (F1255) and the black box theatre (F1221).



C. Pyrotechnics

Pyrotechnics and open flames are not permitted by outside organizations. For more information on pyrotechnics, see Section VI, Special Effects.

D. Special Effects

Certain special effects should be reviewed to ensure all necessary safeguards are in place. Contact the technical theatre faculty on staff for approval.

- Knives, swords or guns
- Fog or smoke
- Strobe Lighting

Any unusual stage effect which raises safety/health concerns:

If the production involves knives, swords, guns or any other type of prop weapon, these props must be cleared with technical theatre faculty. A representative from the production must meet with the technical theatre faculty to determine the appropriate procedures for storage and transportation of these props.

For more information on some of the above effects, please see Section VI, Special Effects.

Emergency Procedures

A. Medical Emergencies

If a serious injury occurs, immediately **call Security at 555** from any campus phone **or 952-487-8280 from a cell phone**. First aid and/or CPR should only be administered by trained individuals. Security can arrange for medical transport to the nearest medical facility. Students should obtain non-emergency medical treatment from a clinic of their choice.

B. Fire Emergencies

In the event of a fire emergency*, Security should be notified immediately at 555 and the following actions are recommended:



1. Activate the fire alarm.
2. Only trained individuals may use a fire extinguisher to attempt to extinguish a small, incipient stage (no larger than a waste paper basket) fire.
3. If the fire is large or spreading – leave the fire area and prevent the fire's spread by closing the doors behind you.
4. Evacuate the building and await the arrival of Security. Try to account for everyone inside the building. Do not leave the area until you have been accounted for.
5. Do not re-enter the building until you are told to do so by Security or the municipal fire official.

C. Chemical Exposure

1. If you spill a chemical such as paint thinners or fabric dyes on your skin:
 - o Immediately rinse the area with water for at least 15 minutes.
 - o Remove any soiled clothing and jewelry while you are rinsing. Discard leather belts or shoes as they cannot be decontaminated
 - o Check the Material Safety Data Sheet (MSDS) to determine if delayed effects should be expected
2. If you get a chemical in your eyes:
 - o Rinse with water for at least 15 minutes, rinsing from the nose outward to avoid contaminating the unaffected eye
 - o Remove contact lenses while rinsing – don't wait to remove them before you rinse
3. If you inhale a chemical or are overcome by fumes:
 - o Leave the room and move to fresh air
 - o Keep door of room open to vent
 - o Do not re-enter a contaminated area

4. If you accidentally ingest a chemical:
 - o Immediately contact the **Poison Control Center at 1-800-222-1222** for instructions
 - o Do not induce vomiting unless directed to do so by a health care provider

For all types of chemical exposure, seek immediate medical attention.

Power Outage

- Remain calm and stay where you are unless there is an imminent threat to your safety (e.g. a fire). Since most power outages last less than 5 minutes, it may be best to remain in place, rather than attempt to evacuate the building.
- If during a performance, front of house personnel should instruct the audience to remain in place and await the restoration of power.
- Call Security at 555 to report the outage or to find out more information.
- If you are in an unlit area, proceed with caution to an area that has emergency lighting. The backlighting on your cell telephone may function as a source of light to help you navigate.
- Persons with disabilities should call Security at 555 for mobility assistance.
- Turn off all computers, light switches and appliances to avoid a surge when the power is restored.

For more information on power outages and other procedures, see the Emergency Procedures Guide for Normandale Community College available in the Security Office (F1250).

Set Design and Construction

A. Planning

The first step in set design is securing a complete set of design drawings in order to have a clear idea of the overall scope of the project. Make sure all set pieces are included, including any furniture and/or prop items that may need to be built. Some key items to consider before you get started:



- ❖ Know your budget
- ❖ Analyze your set plan into individual elements
- ❖ Select your materials
- ❖ Estimate man hours required
- ❖ Know where and how to acquire materials
- ❖ Schedule set assembly & installation

B. Structural Issues for Set Design

Any set design which includes steps, ladders, traps or other specialty devices must be approved by the technical theatre faculty. Mark changes in elevation on the stage with phosphorescent (glow) tape. Pits, traps and other hazards should be marked with signs or barricaded when not in use.

C. Rigging

To safely rig and fly equipment and set pieces, knowledge of both rigging hardware and methodology are necessary. The selection of rigging material and hardware should be based upon the size and type of load and environmental conditions of the workplace. The following guide may be useful in selecting appropriate material:

- **Chains:** Alloy steel chains are strong and able to adapt to the shape of the load. Care should be taken when using chain because sudden shocks will damage them, which may result in chain failure and possible injury. Chains must be visually inspected prior to use. During the inspection, pay particular attention to any stretching, nicks, gouges, and wear in excess of the allowances made by the manufacturer. These signs indicate that the chain may be unsafe and must be removed from service immediately.
- **Wire Rope:** Wire rope is composed of individual wires that have been twisted to form strands. Strands are then twisted to form a wire rope. When selecting a wire rope to give the best service, there are four characteristics to consider: strength, ability to withstand fatigue (e.g., to bend without distortion), ability to withstand abrasive wear, and ability to withstand abuse. Wire ropes must be visually inspected before each use. Wire ropes with excessive broken wires, severe corrosion, localized wear, damage to



end-fittings (e.g., hooks, rings, links, or collars), or damage to the rope structure (e.g., kinks, bird caging, distortion) must be removed from service and discarded.

- **Fiber Rope and Synthetic Web:** Fiber rope and synthetic web slings are used primarily for temporary work and are the best choice for use on expensive loads, highly finished or fragile parts, and delicate equipment. Fiber rope slings deteriorate on contact with acids and caustics. Fiber rope slings that exhibit cuts, gouges, worn surface areas, brittle or discolored fibers, melting or charring must be discarded. Synthetic web slings must be inspected before each use and should be removed from service if found to have acid or caustic burns, melting or charring of any part of the surface, snags, tears or cuts, broken stitches, distorted fittings, or wear or elongation beyond the manufacturer's specifications.

A wide variety of rigging hardware exists for various tasks. Very close attention should be paid to the load capacity of the hardware being used. Items purchased in a typical hardware store are not rated for load, and thus shouldn't be used for load-bearing applications. Never use hardware if the load-bearing capacity is not known. When employing eye bolts for rigging, use only the shouldered variety.

Selection of the correct sling and hardware is only one step in the rigging process. There are a number of factors to consider when lifting a load safely:

Load Size, Weight and Center of Gravity: The center of gravity of an object is that point at which the entire weight may be considered to be concentrated. To make a level lift, the hoist point must be located directly above this point. Load imbalances must be corrected immediately

Number of Legs and Angle with the Horizontal: The smaller the angle between the sling legs and the horizontal, the greater the stress on the individual sling legs. This increased stress effectively decreases the weight that can be safely lifted with any given sling size. Large (heavy) loads can be safely moved by keeping this angle as large as possible and, when necessary, distributing the weight of the load among more sling legs.



Rated Capacity of the Sling: The rated capacity of a sling varies depending upon the type of material the sling is made of, the size of the sling, and the type of hitch. Workers must know the capacity of the sling, and can obtain this information through charts or tables available through the manufacturer. The rated capacity of a sling must not be exceeded under any circumstances.

History of Care and Use: Mishandling and misuse of rigging material and hardware are the leading causes of rigging failure. Following the manufacturer's recommendations for proper care and use are essential for maximum service life and safety. Some general theatrical rigging guidelines include:

- Anything attached to a flybar must have a safety cable attached as well.
- Check that everything attached to a light, including barn doors, gel cases and safety cables, is secure before it is raised.
- Make sure the rope or cord is strong enough for what you are lifting and that the rope or cord is not frayed or damaged in any way.
- Empty all pockets before going onto the grid to ensure that nothing could fall to the stage. Secure all tools to workers with safety lines.
- Wear hard hats whenever overhead rigging is in process.



- Never drop anything from the grid to the floor.
- Do not use equipment whose load-bearing capacity is not known.
- Warn people on the stage or grid before moving any rigged scenery or other objects.
- Maintain visual contact with a moving piece at all times.

Technical theatre faculty perform inspections of rigging and overhead lighting. Rigging should also be inspected by the production crew before each use.

D. Personal Protective Equipment

Personal protective equipment includes all types of equipment used to increase individual safety while performing potentially hazardous tasks. This may include eye and face protection, head protection, foot protection, hand protection, respiratory protection, or any equipment used to protect against injury or illness. Personal protective equipment items may be purchased from most hardware stores or through any safety supply catalog.

Safety Glasses: Safety glasses look very much like normal glasses but are designed and manufactured to certain standards to protect against flying particles. Safety glasses have lenses and frames that are impact resistant and are far stronger than regular street wear. Safety glasses must have side shields and should be worn whenever there is the possibility of flying particles, dust, wood chips, or paint to enter the eye. Always wear safety glasses when using any power tool.

Goggles: Goggles are tight-fitting eye protection that completely cover the eyes, eye sockets and the facial area immediately surrounding the eyes and provide protection from impact, dust and splashes. Safety goggles may have regular or indirect ventilation. (Goggles with indirect ventilation may be required if you are exposed to splash hazards, e.g., solvents, paints or thinners).

Gloves: Gloves are often relied upon to prevent cuts, abrasions, burns, and skin contact with chemicals. It is important to select the most appropriate glove for a particular application and to determine how long it can be worn,



and whether it can be reused. Nitrile gloves should be worn when handling large amounts of solvents or paint thinners. Leather work gloves should be used in material handling to avoid severe cuts, lacerations, and abrasions. Work shoes and boots: Leather work shoes or boots with impact protection should be worn when there is the potential for foot injuries from falling or rolling objects. Leather work shoes or boots with puncture protection are recommended where sharp objects such as nails, wire, tacks, screws, large staples, etc., could be stepped on causing a foot injury. Open-toed shoes may not be worn during any phase of set construction.

E. Power and Hand Tools

Crew members should use a power tool only after receiving proper training. Stage managers should review the operation of the equipment, making sure to point out safety features and guards. Crew members should be familiar with the owner's manual for the tool, and should know both the use and the limitations of a power tool.

Some guidelines for using tools include:

- ❖ Inspect tools before use to check for any defects such as frayed wires, or damaged hand tools. Remove defective tools from service and have repaired or replaced.
- ❖ Only use power tools that are grounded with a 3-pronged plug or that are double-insulated.
- ❖ Never carry or hoist a power tool by its cord.
- ❖ Unplug power tools before loading them, changing blades or bits, making adjustments, or cleaning them – and follow the manufacturer's instructions.
- ❖ Never use power tools on wet surfaces or in wet weather.
- ❖ Discontinue use of defective or unsafe equipment as soon as the defect becomes known.
- ❖ Dull tools are unsafe and can damage work. Maintain your tools and always use sharp cutting blades.
- ❖ Never alter or remove any machine or blade guards unless under the supervision of technical theatre faculty.



F. Ladders

Portable ladders should be inspected at frequent, regular intervals and maintained in good condition free from oil, grease, or other slippery materials. Defective ladders should be removed from service until repaired. Those that cannot be repaired should be destroyed.

Ladders should always be placed on stable bases and, whenever possible, should be secured near the top and at the bottom. Boxes, barrels, or other unstable surfaces should never be used to extend the reach of a ladder.

Never leave tools on a ladder and never drop or throw tools to another worker. It is safer to climb a ladder, drop a line and haul an object up rather than carrying heavy objects up a ladder.

G. Chemical Hazards

The key to safe chemical usage is to be aware of information on the physical and health hazards of chemicals, safe handling precautions, and emergency and first aid procedures.

Each chemical container bears a manufacturer label with the chemical name(s), hazard warnings, and the manufacturer's name and address. Labels must not be removed or defaced. If the product is transferred from one container to another, the new container must be labeled with the product name, the names of all hazardous chemicals and/or the five most predominant chemical constituents.

The theatre department must obtain and maintain a Material Safety Data Sheet (MSDS) for each hazardous material used. These MSDSs must be accessible to individuals working with the products during all work hours. If an MSDS is not received with a product, the theatre department must obtain the MSDS within a reasonable amount of time.

Paints, Inks, Pigments and Dyes

There are many different types of paints, inks, pigments and dyes used in the theatre. Some hazards are well known, while some are not yet understood. Prudence dictates handling all materials cautiously.



- Obtain Material Safety Data Sheets (MSDSs) on all paint and dye products. If pigments and dyes are not identified by their Color Index (CI) names or numbers, ask your supplier for this information.
- Use MSDSs and product labels to identify the hazards of any toxic solvents, acids, or other chemicals in dyes, paints, inks, mordants, or other materials.
- Use water-based products whenever possible.
- Buy premixed paints and dyes if possible. Dyes packaged in packets that dissolve when dropped unopened into hot water also can be handled safely. Pigments and dyes are most hazardous and inhalable in a dry powdered state.
- Weigh or mix dye powders or other toxic powders where local exhaust ventilation is available.
- Avoid dusty procedures. Sanding dry paints, sprinkling dry pigments or dyes on wet paints or glue, and other techniques that raise dust should be discontinued or performed in a local exhaust environment.
- Spray paints or dyes only under local exhaust conditions or outside
- Avoid skin contact with paints and pigments by wearing gloves or using barrier creams. Use gloves with dyes. Wash off paint splashes with safe cleaners like baby oil followed by soap and water, non-irritating waterless hand cleaners, or plain soap and water. Never use solvents or bleaches to remove splashes from your skin.
- Wear protective clothing, including a full-length smock or coveralls. Leave these garments in the scene shop to avoid bringing dusts home.
- Work on easy-to-clean surfaces and wipe up spills immediately. Wet mop and sponge floors and surfaces. Do not sweep.
- Avoid ingestion of materials by not eating, smoking, or drinking in your workplace. Never use your lips to make a point on a brush; do not hold brush handles in your teeth. Never use cooking utensils for dyeing. A pot that seems clean can be porous enough to hold hazardous amounts of residual dye. Wash your hands before eating, drinking or smoking.
- Keep containers of paint, powdered dyes, pigments and solvents closed except when using them.

(Rossol, M.: Stage Fright, Health & Safety in the Theater, 1991, Allworth Press)



Many paints and solvents are flammable and present their own class of hazards. Vapors from flammable liquids ignite readily when mixed in certain proportions with air in the presence of an ignition source and could result in an explosion. Flammable and combustible liquids vaporize and form flammable mixtures with air when in open containers, when leaks occur, or when heated.

- ✓ Use nonflammable materials like water base paint whenever possible. Water-base or latex paints are less hazardous and allow for easier clean-up and disposal than oil-based paints.
- ✓ Buy as you need it -- quantities should be limited to the amount necessary for the work in progress.
- ✓ Control all ignition sources in areas where flammable liquids are used. No smoking or open flames should be present during the use of flammable liquids.
- ✓ Spray paint cans are under extreme pressure and could rupture when exposed to fire
- ✓ Never puncture aerosol cans or expose them to high heat or other stresses
- ✓ Read and follow the manufacturer's label and precautions on aerosol cans
- ✓ Paints and thinners should not be mixed with general trash or poured down the drain. Contact Building Services at extension 8110 if you have flammable liquids to be disposed.

H. Chemical Spills

In the event of a chemical spill, the individual(s) who caused the spill is responsible for prompt and proper clean up. Improper clean up of a spill may result in injury, illness, fire, a release to the environment, or property damage.



Contact Security at 555 if:

- There is a fire or medical attention is needed
- The quantity of material spilled is more than one gallon
- You are uncomfortable in your ability to clean up the spill
- There is a release to the environment (i.e., soil, waterways, sewer, etc.)

Planning for spills is essential. Before beginning work with chemicals, be sure that the appropriate types and amounts of spill clean-up materials and personal protective equipment are immediately available.

Review Material Safety Data Sheets or other references for recommended spill clean-up methods and materials, and the need for personal protective equipment (e.g., gloves, aprons, etc.)

General guidelines for cleaning up spills:

- ✚ Immediately alert others in the area, and evacuate the area, if necessary
- ✚ Contaminated clothing must be removed immediately and the skin flushed with water for no less than fifteen minutes. Clothing must be laundered before reuse
- ✚ If a volatile, flammable material is spilled, immediately warn others in the area, control sources of ignition and ventilate the area

I. Special Materials

1. Precautions for CCA-Treated Wood Products

Chromated Copper Arsenate (CCA) is a chemical preservative used to protect wood from rotting due to insects and microbial agents.

Manufacturers of CCA treated wood have reached an agreement with the EPA to end the manufacture of CCA-treated wood for most consumer applications by December 31, 2003. However, in light of the fact that some wood products may still remain in stock, the EPA and the Consumer Product Safety Commission recommends the following precautions when working with CCA-treated wood:



- ✓ Cut, sand and machine CCA-treated wood outdoors. Wear a dust mask, goggles and gloves.
- ✓ Clean up all sawdust, scraps and other construction debris thoroughly and dispose of in the trash. Do not compost or mulch sawdust or remnants from CCA-treated wood.

Do not burn CCA-treated wood

After working with CCA-treated wood, wash all exposed areas of your body, especially the hands, thoroughly with soap and water before eating, drinking, toileting, or using tobacco products.

2. Plastics

Theatre workers use plastics for a variety of applications, such as casting applications, structural elements, and costuming. Equally as varied are the different types of materials and processes used to achieve these effects:

1. Polyester casting systems - There are several hazards associated with these systems, including the crosslinking agent (commonly styrene), the initiating agent (a peroxide), and sometimes fiberglass used for reinforcement.
2. Epoxy Resins - Epoxy resins are usually two-component systems, the epoxy and the curing agent. Heat is generated during the curing process. Epoxies can be sensitizing agents, causing an allergic skin reaction.
3. Polyurethane Resins - Many theatrical professionals have ceased to use polyurethane foam casting systems due to the health hazards associated with these products. Polyurethane resins can give off hazardous products such as hydrogen cyanide gas and carbon monoxide when heated or burned
4. Finished plastic products - Hazardous decomposition products can be released when finished plastic products are subject to cutting, sanding, press molding, grinding, heat shrinking, torching or melting. Certain types of plastics offer additional hazards when cutting or heating.



J. Storage of Materials

The proper storage of materials in theatre spaces is extremely important to the efficiency of the production and the safety of the cast, crew and audience.

- Flammable and combustible liquids must be stored in approved flammable storage cabinets.

- If the building has sprinklers, materials must be a minimum of 18 inches below sprinkler heads. Materials in any building must be a minimum of 24 inches below the ceiling.

- Materials must never obstruct an exit from the building.

- Stored materials must be a minimum of three feet in all directions from unit heaters, duct furnaces and flues Smoking is prohibited in all places of assembly and in spaces where combustible materials are stored or handled Materials may not be stored under seating risers or steps.

K. Lifting and Material Handling

Back pain and injuries related to lifting and material handling are some of the most frequent types of injuries. While some factors that contribute to the potential for injury cannot be controlled, others can be reduced or minimized. Stage pieces are often awkward, heavy, or unusually shaped, which impedes proper lifting techniques.

Some general lifting techniques include:

- ❖ Perform warm-up exercises prior to lifting – Warming up your back muscles can help increase blood flow and reduce the stress of an initial lift.

- ❖ Use the right personal protective equipment – Some work gloves offer non-slip grips to handle a load easier. Wear non-slip shoes to avoid a fall while carrying a load.



- ❖ Take time to size up the load – Is it too large or heavy for one person to lift? Will you be able to get through doorways and corridors as you are carrying it? Can it be broken down into several trips?
- ❖ Plan your route ahead of time – Make sure there is a clear path to avoid tripping hazards. Be able to see where you are going and avoid sharp turns or difficult courses.
- ❖ Back belts provide no protection from back injuries.

Proper lifting techniques

Theatre workers use plastics for a variety of applications, such as casting applications, structural elements, and costuming. Equally as varied are the different types of materials and processes used to achieve these effects:

1. Stand close to the load – Carrying an object as close to your body as possible will keep the strain on your back at a minimum and will also help keep your center of gravity over your feet to maintain balance.
2. Bend your knees – Your leg muscles are much more equipped to handle heavy loads than your back muscles. Bending your knees will allow you to lift with your legs and reduce the load on your lower back.
3. Grip the load securely – Get a secure handle on the object before you lift to avoid slipping. If a load does start to fall away from you, let it go. Severe injuries can occur if you attempt to catch a heavy object in an awkward position.
4. Follow these steps in reverse to lower the load – Back injuries can just as easily occur when putting down a load as when lifting it. Make sure you keep the load close to you and use your legs while lowering the load to the floor.

L. Housekeeping

Work areas can become congested while set building and rehearsals take place. Clutter makes it difficult to move around and can be a fire hazard. To prevent accumulation of materials, trash should be removed daily.

- ✚ Place trash in proper receptacles.
- ✚ Clean up after each work session.
- ✚ Purchase materials as needed to avoid the need for additional storage. Store tools in the proper areas when not in use.

Housekeeping is the sole responsibility of the students under the supervision of theatre faculty. This includes the dressing rooms, scene shop, and audience seating areas.

Lighting and Sound

Stage lighting and audio effects are an essential element of every theatrical production. Lighting can set the tone for an entire production, while audio systems are used to enhance the voices of performers as well as music and special effects. This section will address the primary hazards of working with stage lighting and sound systems.

A. Electrical Safety

Electricity is intrinsic in modern life. However, many students have never worked with electricity directly before working on stage. To work near electricity safely, it is necessary to understand what hazards it presents, and how these hazards can be controlled.

How Shocks Occur

Electric shock occurs when the body becomes a part of an energized circuit. The current enters the body at one point and leaves at another. Electric shock normally occurs in one of three ways - individuals, while in contact with the ground, come in contact with:

- Both wires of the electric circuit.
- One wire of an energized circuit and the ground.
- A metallic part that has become “hot” by contact with an energized conductor.

The metal parts of electric tools may become energized if there is a break in the insulation of the tool or machine wiring.

Severity of Shocks

The severity of the shock received when a person becomes a part of an electric circuit depends on three primary factors: the amount of current flowing through the body (measured in amperes), the path of the current through the body, and the length of time the body is in the circuit. Effects can range from a barely perceptible tingle to immediate cardiac arrest, depending upon the type of circuit, its voltage, resistance, current, etc. The table below shows the general relationship between the amount of current and the degree of injury. While reading this chart, keep in mind that most electrical circuits can provide, under normal conditions, up to 20,000 milliamperes of current flow.

Current	Reaction
1 Milliampere	Perception level
5 Milliamperes	Slight shock felt; not painful but disturbing
6-30 Milliamperes	Painful shock; “let-go” range
50 - 150 Milliamperes	Extreme pain, respiratory arrest, sever muscular contraction
1000 - 4300 Milliamperes	Ventricular fibrillation
10,000+ Milliamperes	Cardiac arrest, severe burns and probable death

A severe shock can cause considerably more damage to the body than is visible. For example, a person may suffer internal hemorrhages and destruction of tissues, nerves, and muscles. In addition, shock is often only the beginning in a chain of events. The final injury may well be from a fall, cuts, burns, or broken bones.



Preventing Electrical Hazards

Equipment: All fixed wiring and temporary wiring should be grounded or double-insulated. Use UL (Underwriters Laboratory) approved equipment. All dimmers and light boards should have a dead (non-conducting) front.

Repairs: Students should not attempt electrical repairs without proper training. Equipment that malfunctions or causes shocks should be removed from service, clearly marked and repaired by a qualified individual.

Extension Cords: Extension cords are only designed for temporary use. Use only three-wire heavy duty (number 16 or lower) extension cords. Never use zip cord (number 18 wire) or other light duty cords. Use of thin, light duty extension cords can increase the risk of fire and shock. Make sure extension cords have adequate current capacity for the equipment being used. Do not pull an electrical cord out of a socket by the cord. This breaks interior wires and can cause a short and, possibly, a fire. Inspect for frayed or split cords or plugs before use.

Electrical Cords: Electrical cords can also be a tripping hazard. It is a good practice to route cords away from traffic areas to prevent trips and falls.

- Avoid stretching or pinching cords between objects. This can break interior wires, causing overheating which can result in a fire.
- Protect temporary wiring from traffic by covering with a treadle. Do not cover electrical cords with rugs; this can also result in a fire.

Circuit Protection Devices: Circuit protection devices are designed to automatically limit or shut off the flow of electricity in the event of a ground-fault, overload, or short circuit in the wiring system. A ground-fault circuit interrupter, or GFCI, should be used in high risk areas such as wet locations or outdoor sites. Portable GFCIs are available from any hardware store or safety supply catalog.

Training: Training is essential in working with lighting circuitry, dimmers and instruments. Students should be trained before being authorized to work the control areas.

Work Practices: Never work alone on hazardous lighting procedures, such as hooking up panels. Keep food and beverages out of the light control areas to prevent possible shocks and damage to the circuitry.

B. Lighting Equipment

Normandale Community College theatre spaces use standard size lamps and dimmers as shown below.

Lamps	
Fresnels	BTL 500W
	OBJ:OBJ:BTN 750W
	OBJ:OBJ:BTR 1000W
Ellipsoidals (ERS)	OBJ:FEL 1000W
	OBJ:EHD 500W
	OBJ:OBJ:EHG 750W
Source 4	OBJ:OBJ:OBJ:HPL 575W
Dimmers	
	OBJ:OBJ:1.2 kilowatt (1200W maximum)
	OBJ:OBJ:2.4 kilowatt (2400W maximum)

Lighting dimmers have limits to the lamp loads they can handle. Overloading dimmers can cause a fire hazard. The wattage of the bulbs MAY NOT exceed that of the dimmers they are plugged into.

Several methods exist for changing the color of light projected, most commonly, the placement of color media, such as gels, tinted glass, or dichroic filters, in front of the instrument. Several companies sell color media and only those materials intended for such use should be employed. Common materials may not withstand the intense heat and light of stage lighting and may be a fire hazard.

Projected light patterns can be achieved by placing a pattern, template or gobo in a holder and inserting it into the slot at the gate of an ellipsoidal. Many of the same companies that sell color media also sell a wide range of off-the-shelf patterns. Short lived custom patterns can be cut out of several layers of black aluminum foil (commonly known as the trade name Cinefoil) using a razor blade. For the ETC SourceFour ellipsoidals (due to their lower gate temperature), short lived custom patterns can also be cut from aluminum foil oven liner trays cut to holder size.

C. Audio Equipment

Just as dimmers must not be overloaded with too many lamps, power amplifiers must not be overloaded with too much load. Power ratings for amplifiers are usually specified in load capacity, while speakers (or other loads) are assigned impedance (typically 4 or 8 ohms). Damage to an amplifier can occur if it is not rated for the load being driven.

In an audio system, all devices should be connected to the same ground at the same point. This helps eliminate ground loops, a problem caused by different ground levels on different circuits. The problem usually manifests itself as hum in the audio system, but can result in electrical shocks. For this reason, the amplifiers, sound board, and all other audio equipment need to be grounded at the same point. Additionally, never connect audio equipment to the same circuit as lighting equipment. Disregarding this recommendation can result in spurious noise in the audio system and damage to sensitive audio equipment. (*WPI Technical Theatre Handbook, Stephen Scott Richardson*).

D. Fall Protection

The procedure for hanging and/or focusing lights may require the need for work on catwalks and scaffolding.

1. **Catwalks:** Catwalks are equipped with railings built to specific regulations to protect from falls. Catwalk railings should not be removed unless some other form of fall protection is employed

2. **Scaffolding:** For theatrical work, the OSHA standard 29 CFR 1910.28, Safety Requirements for Scaffolding, applies strict requirements for scaffolding use. The erection, securing and dismantling of any type of scaffolding must be overseen by a trained, "competent person".

Empty all pockets before hanging lights. Crew members should make sure that nothing on their person could fall to the stage. Secure all tools with safety lines.

E. Ladders

Portable ladders should be inspected at frequent, regular intervals and maintained in good condition free from oil, grease, or other slippery materials. Defective ladders should be removed from service until repaired. Those that cannot be repaired should be destroyed.

Ladders should always be placed on stable bases and, whenever possible, should be secured near the top and at the bottom. Boxes, barrels, or other unstable surfaces should never be used to extend the reach of a ladder.

Special Effects

A. Use of Pyrotechnics

Use of pyrotechnic devices are highly discouraged in theatrical productions. In the event pyrotechnic devices are required, technical theatre faculty will be required to submit a plan to the campus safety supervisor. The plan must contain the following information:

- ❖ Date and time of day of the production
- ❖ Exact location of the production
- ❖ Name of the person actually in charge of firing the pyrotechnics (i.e., the pyrotechnic operator)
- ❖ Number and names of all assistants who are to be present
- ❖ Number and types of pyrotechnic devices and materials to be used.
- ❖ Diagram of the grounds or facilities where the production is to be held.

This diagram shall show the point at which the pyrotechnic devices are to be fired, the fallout radius for each pyrotechnic device used in the performance, and the lines behind which the audience shall be restrained



- ❖ Point of on-site assembly of pyrotechnic devices
- ❖ Manner and place of storage of the pyrotechnic materials and devices
- ❖ Material safety data sheet (MSDS) for the pyrotechnic material(s) to be used as well as manufacturer's directions and specifications
- ❖ Certification that the set, scenery, and rigging materials are inherently flame-retardant or have been treated to achieve flame retardancy
- ❖ Certification that all materials worn by performers in the fallout area during use of pyrotechnic effects shall be inherently flame retardant or have been treated to achieve flame retardancy
- ❖ Names for two fire watch personnel
- ❖ On-site testing of the pyrotechnic effect

B. Knives, Swords or Guns

If the production involves knives, swords, guns or any other type of prop weapon, these props must be cleared with technical theatre faculty. A representative from the production must meet with the technical theatre faculty to determine the appropriate procedures for storage and transportation of these props.

All productions utilizing weapons will be assigned a weapon master. The weapon master is responsible for weapon safety, upkeep, and storage of all weapons. Only performers approved to handle weapons will be permitted to do so. Weapons are not permitted beyond the immediate performance space. Weapons masters will be trained by technical theatre faculty and Security will be notified of any use of weapons in productions.

Prop knives and swords can be rented from several prop companies. No real knives or swords may be employed without modification.

C. Items Suspended Above the Audience

Students are not permitted to rig items above the audience. If a production requires rigging above an audience, this rigging will occur by the trained technical theatre faculty or staff.

D. Pits, Traps and Changes in Elevation

Any set design which includes steps, ladders, traps or other specialty devices must be approved by the technical theatre faculty. Mark changes in elevation



on the stage with phosphorescent (glow) tape. Pits, traps and other hazards should be marked with signs or barricaded when not in use.

E. Fog or Smoke

Commercially available fog and smoke machines may be rented or purchased from various theatrical supply companies. Planning must include the proper volume of smoke or fog and ensuring that exit aisles and doors are kept visually clear.

If large quantities of smoke or fog will be utilized in a production, Security will be notified and the alarm system will be put into test mode to prevent accidental alarm. If fog or smoke is to be used in a production, warnings should be posted at the front of house or entrance doors to the theater as well as in a program, if distributed. Example: **“WARNING: Synthetic fog is used during this performance”**.

On-Stage Smoking Policy and Philosophy

The director will carefully consider, in consultation with the production team, whether on-stage smoking is essential to the action of the play. Only if it is determined that it is essential to the action of the play, will smoking on stage be permitted. The director and other members of the production team will work with the actor who will smoke in order to find a type of cigarette, including herbal or vegetable, that the actor feels he or she can comfortably tolerate.

In accordance with local and state statutes, smoking is prohibited in the dressing rooms or backstage.

Audiences will be made aware that there will be smoking in the performance through a variety of means including lobby signs.

F. Strobe Lighting

Certain people with epilepsy and photosensitivity may suffer a seizure if exposed to flashing or strobe lighting. If strobe lighting is to be used in a production, warnings should be posted at the front of house or entrance doors to the theatre as well as in a program, if distributed. Example: **“WARNING: Strobe lights are used during this performance.”**



Cast and Crew

A. Cosmetics

Products approved for makeup use have been tested extensively for toxic hazards. Only these products should be used for stage productions. Old containers of makeup could contain bacteria and should be thrown away. A good practice is to wash your face and hands before and wash your hands after applying cosmetics. If you are using makeup from a “communal” make-up kit, use a clean brush or your hands to apply. Shared makeup should not be applied directly to your face. The following guidelines are recommended for shared makeup users:

1. **Cream sticks:** Slice these out on to individual papers such as butter trays. Label and reuse them individually for touch-ups.
2. **Lipsticks:** These too can be sliced and labeled. For a long running show, individual lipsticks should be provided.
3. **Pancakes and powders:** Powdered products provide a less viable environment for infection, but try to individualize usage. Supply powders in the smallest containers available.
4. **Mascara:** Use individual applicators/containers if possible.
5. **Eyeliners and Eye makeup:** Use individual products if possible.
6. **Brushes:** Use disposable brushes.
7. **Sponges:** Use disposable sponges whenever possible. Give out individual sponges at the beginning of a show, and maintain separate use.
8. **Miscellaneous:** Any type of facial hair, skullcaps, sequins, or other face product should be disinfected before use by a new performer. Use an approved bactericide for disinfection. These types of products should be carefully stored in labeled individual plastic bags between performances.

Makeup artists should make a practice of washing their hands between actors. Sponges and brushes should be washed after use on each individual.

For special makeups, putty, wax, beeswax, and morticians' wax all can be used to build up a part of the face for theatrical purposes. They all have similar properties, but they differ slightly in hardness. Collodion can be used to create



mock wrinkles or scars. Latex can be made to function in many ways, and it also acts as a glue, as does spirit gum. You can replace spirit gum with surgical adhesive when resistance to moisture and excessive motion of the skin are not called for.

It can be harmful to remove spirit gum and latexes by pulling them off of the skin. Peel them off gently and apply as little solvent, such as acetone or alcohol, as possible. Once they are removed, use oil, emollients, or moisturizers as needed to counter the drying effects of the solvents. (*Rossol, M.: Stage Fright, Health & Safety in the Theater, Allworth Press, 1991*)

B. Fatigue

Fatigue is a serious safety concern that should be considered during all stage productions. With performance dates approaching, most crew members can become severely overworked.

Follow these simple guidelines to avoid fatigue:

- ✦ **Get proper rest:** The average person requires 8-9 hours of sleep per night.
- ✦ **Limit drugs:** Drugs might contribute to fatigue (tranquilizers and cold/allergy medications). Reduce caffeine, nicotine and alcohol which can also contribute to fatigue.
- ✦ **Take frequent breaks while working:** Repetitive or long work sessions can reduce one's ability to concentrate on the work at hand.
- ✦ **Plan ahead:** Having your building materials and equipment ahead of time can increase efficiency and reduce the work time required.
- ✦ **Know when to quit:** Recognize signs of fatigue – loss of concentration, slow reaction times, memory loss – and knock off for the day.

C. Heat Stress

Theatre spaces are often without air-conditioning and, even if they are air-conditioned, stage lighting can produce an incredibly hot glow. Add to that the stress and/or excitement of performing and cast members are prime candidates for heat stress. Working in hot conditions may pose special hazards to safety and health.



Drink plenty of liquids during a performance to replace the fluids lost from sweating – as much as one quart per hour may be necessary. Water and/or sports drinks are recommended. Caffeinated beverages such as cola, iced tea and coffee should be avoided.

Performance

A. Crowd Control

Attendance for an event can be controlled through ticket sales, so overcrowding does not become an issue. The need for security measures at events is determined by theatre faculty and Security.

B. Front-of-House Personnel

The house manager and all front-of-house personnel must assist the audience to evacuate the building safely in case of an emergency. A fire safety and evacuation plan must be prepared and all personnel should be trained in the duties they are to perform under the plan.

If an alarm sounds:

The House Manager must alert patrons from the stage of the emergency and the need to evacuate. Ushers should lead the audience to exit doors and evacuate to the designated assembly point. Security will respond and notify personnel when it is safe to re-enter the building.

C. Exits (Means of Egress)

The means of egress is the continuous and unobstructed path of travel from any point in a place of assembly to an exit or public way (e.g., sidewalk, street, etc.). All parts of the means of egress must be available for immediate, emergency use.



Aisles and corridors must be unobstructed and kept free of flammable or combustible materials.

Faculty must inspect the means of egress immediately prior to any event and remove any obstructions immediately.

Exit doors must be unlocked.

Care must be taken to ensure that the exit discharge is also unobstructed (e.g., not blocked by dumpsters or vehicles, no materials stored against the exit door, all snow removed, etc.).

All exit signs must be clearly illuminated and unobstructed at all times. The width of a means of egress cannot be blocked or reduced.





Draperies or similar decorative hangings cannot obstruct the view or the access to an exit. Mirrors cannot be placed near an exit in any manner that may confuse those trying to exit.

Exits cannot be used for any other purpose other than a means of egress. Spaces within a stairway enclosure are not to be used for storage of any materials.

Strike

A. Set Deconstruction & Material Disposal

Strike will be conducted and organized by a theatre faculty member. All items must be returned to storage or otherwise disposed of immediately following the final performance, e.g.:

-  Lighting instruments, cables and control equipment properties
-  Sound equipment
-  Scenery and platforms
-  Costumes



Set deconstruction should take place in a careful, organized manner. If necessary to dispose of set materials, contact Building Services at extension 8110 to request a dumpster. Materials should not extend above the lip of the dumpster container.

B. Housekeeping

The facility must be left in good condition after the strike. All spaces must be left in good condition, furniture returned to its proper place, etc.

C. Chemical Waste Disposal

Most commonly used organic solvents (e.g., acetone, methanol, toluene, mineral spirits, turpentine) and paints are considered hazardous waste and cannot be disposed of with regular trash or poured down the drain. **If you have hazardous waste to be disposed of, contact Building Services at 8110 for pick up.**

Reviewed 5/11/2015