

DEFINITION

SAFETY: The condition of being free from undergoing or causing hurt, injury, or loss.

Good safety habits plays an important part in everything you do. Something as simple as walking or driving down the street can be dangerous if you don't pay attention to your surroundings.

Remember that accidents injure, disable, and kill thousands of people every year. The electronics industry is no exception. Engineers can design and build safety devices into a piece of equipment. Unfortunately, they cannot design and build safety devices into you.

Safety is your job. You must be responsible for your own safety. Help ensure your safety when working around electricity and electronic devices by learning to:

- ◆ Recognize and avoid potential dangers.
- ◆ Pay attention to all warnings and cautions.
- ◆ Follow good personal and laboratory safety habits.

In this course your chances of working with any equipment that could cause an electrically related accident are as small as possible. Any work around electricity and electronic devices, however, can be dangerous under certain conditions. Thus, you must be aware of what causes accidents and pay attention to all warnings and cautions. You must also develop and follow good safety habits.

THE GROWTH OF INDUSTRIAL SAFETY

The subject of safety in the work place is not new. The emphasis safety receives today, however, is much greater than it was in the early 1900s. Most shops in those days employed only one or two workers, and each worker looked out for himself. Safety was up to the individual.

Then came the Industrial Revolution, bringing in the age of large factories. Employers crowded their workers closely together in a machine environment. No longer could an individual worker control his own safety. Most employers refused to spend the money needed to provide safe working conditions for their workers.

The situation became so bad that the United States government stepped in. Through the years, the government enacted many separate worker protection laws. These laws were finally collected into the 1970 Occupational Safety and Health Act (OSHA). OSHA lists in detail all the federal legislation covering safety in the work place.

Thanks to OSHA, rarely does anyone today have to work in unsafe conditions. Working around electricity and electronic devices can still be hazardous, though, unless each individual worker remembers to:

-- THINK SAFETY! --

WHAT CAUSES ACCIDENTS?

Industrial accidents injure, disable, and kill many workers every year. Most of these accidents need not have happened. Knowledge of potential dangers and the practice of good safety habits can prevent most accidents from happening.

Just what are the potential dangers in the electronics industry? What dangers must workers learn about so they can avoid accidents? The most common causes of accidents in the electronics industry are:

1. Electrical shock
2. Electrical burns
3. Electrical fires
4. Misuse of tools and equipment

Before you use any electronic equipment, learn to recognize these most common causes of accidents.

1. Electrical Shock.

Most everybody knows what happens if you shuffle your feet across a carpet and then touch a doorknob. Many people also know what a sharp jolt you can get from handling a cracked or frayed, plugged-in extension cord. If you ever felt the shock from touching an electric can opener with wet hands, you're not likely to forget it.

The possibilities of receiving an electrical shock are many. Some of these shocks, like those mentioned above, are mild. Mild shocks cause only a muscle jerk or spasm. Other shocks, however, can be strong enough to kill you. All electrical shocks are potentially dangerous.

If you've never felt an electrical shock, don't be eager to try it. The shock you feel might not be a mild one.

Always be on the alert for the possibility of electrical shocks.

ELECTRICAL SHOCKS HAPPEN WITH NO WARNING.

2. Electrical Burns.

Electrical burns also occur with no warning. We all know that we'll get burned if we touch a fire or even a turned-on light bulb. However, did you know that electricity can produce enough heat to cause a severe burn? If you didn't know before, you do now.

Electrical burns are a very serious danger, since electrical heat is not often easy to recognize. Take an electric iron, for instance. An iron is a perfect example of a heat-producing electrical device which displays no visible sign that it can burn you.

Did you know radar and microwaves can also burn you? You can't see the high-energy radiating signals produced by radar and microwaves, but don't get too close to them. Their signals can burn you.

Electrical circuits can also become hot enough to burn you. Some circuits are designed to be hot; others are not. Any circuit that is not working correctly, however, can get hot enough to burn you.

Always be on the alert for the possibility of electrical burns.

ELECTRICAL BURNS HAPPEN WITH NO WARNING.

3. Electrical Fires.

Everyone knows that fire can be dangerous. Everyone also knows that fires are easier to prevent than they are to put out.

Broken equipment causes most electrical fires. Any electrical equipment that is not working correctly can get hot enough to start a fire. Unfortunately, you usually cannot predict when an electrical device will break down.

Be on the alert for unexpected equipment breakdowns which can cause fires. By staying alert, you can prevent electrical fires before they start.

Always be on the alert for the possibility of electrical fires.

ELECTRICAL FIRES HAPPEN WITH NO WARNING.

4. Misuse of Tools and Equipment.

Accidents frequently result from misuse of tools and equipment. Misuse can be:

- ◆ Using the wrong tools or equipment for the job.
- ◆ Using your tools or equipment incorrectly.

Any work is dangerous if you use the wrong tool for the job. For instance, take the job of chopping up onions to put on top of a pizza. If you use an axe instead of a knife to chop the onions, you're asking for trouble.

Using your tools or equipment incorrectly is equally dangerous and has caused many accidents. Remember, you can damage your equipment and/or injure yourself if you use your tools or equipment incorrectly.

Always be on the alert for the possibility of accident from misuse of your tools and equipment.

ACCIDENTS HAPPEN WITH NO WARNING.

WARNINGS AND CAUTIONS

Warnings and cautions attract our attention to dangers in many areas of our daily lives. They alert us to situations where we should pay special attention to safety. Warnings and cautions can help you, no matter how much you know about safety or how cautious you are.

You find warnings and cautions on many products you use every day. For example:

- ◆ **WARNING: KEEP OUT OF REACH OF CHILDREN**, on a bottle of aspirin.
- ◆ **SURGEON GENERAL'S WARNING: Cigarette Smoke Contains Carbon Monoxide**, on a pack of cigarettes.
- ◆ **CAUTION: CONTACT WITH EYES CAN CAUSE IRRITATION**, on a bottle of window cleaner.

In your work around electricity and electronic devices, you will find two types of warnings and cautions:

1. Warning and caution statements
2. Warning and caution signs and tags

1. Warning and Caution Statements.

Any technical book or manual you pick up contains warning and caution statements. These statements alert you to different types of dangers.

- ◆ Warnings always alert you to dangers that can harm you.
- ◆ Cautions always alert you to dangers that can harm your equipment.

Your lessons in this course display many warning and caution statements. Be sure to read all warning or caution statements in your lessons. When you see one, pay close attention and follow carefully what it says. By doing so, you will protect both yourself and your equipment.

Figure 6 illustrates what the warning and caution statements will look like in your lessons.

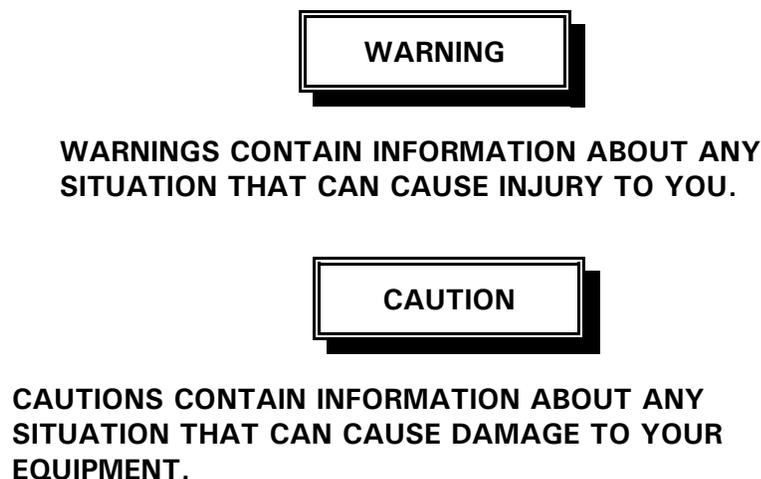


Figure 6. Sample Warning and Caution Statements

2. *Warning and Caution Signs and Tags.*

All employers must display special warning signs and/or tags to alert their employees of dangers in the work place. These signs are much like those you see every day along the highway. The highway signs warn you of potential dangers such as a sharp curve in the road or one-way traffic.

Signs and tags in the work place alert you to dangers such as high voltage, radiation, and electrical shock. You will find these signs and tags posted on walls, doors, equipment, and switches where they are easy to see. Big, bold letters on these signs and tags spell out words such as DANGER, WARNING, and CAUTION.

Figure 7 illustrates some warning and caution signs and tags you might find in the workplace.



Figure 7. Sample Warning and Caution Signs and Tags

PERSONAL AND LABORATORY SAFETY HABITS

In this course you will work in a laboratory. Even if you have just a desk, the Nida Model 130E Test Console, and some test equipment, your work area is a laboratory. Your work habits and safety in the laboratory should be no different from those you would practice as an employee in the work place.

Good judgment and common sense go a long way in preventing accidents. They cannot, however, guarantee your safety in the work place. To prevent accidents in the work place, you must also develop and follow good personal and laboratory safety habits. As you learn about electronics, you will also learn more about the dangers involved. For your own safety, you must add to your safety habits as you learn, by applying what you learn to your work practices.

The Safety Rules below list some of the most important rules of behavior for personal and laboratory safety. Learn these rules, and start building your own good safety habits by following all of them. Become so familiar with this list of Safety Rules that you follow them instinctively.

SAFETY RULES

1. Secure all loose clothing and tie back long hair when working on or near rotating machinery.
2. Remove all rings and other jewelry when working with electrical or mechanical devices.
3. Wear appropriate safety equipment, such as gloves and goggles, when required to do so.
4. Save all practical jokes and horseplay for outside the work area. Such behavior has no place in school or at work.
5. Keep all hand tools clean and in safe working order.
6. Keep work area and floor clean of scraps and litter.
7. Check over all tools and equipment before using them. Report any defects or problems to your instructor.
8. Pay attention to all safety devices, such as fuses, circuit breakers, interlocks, ground straps, switch covers, and three-prong plugs.
9. Do not remove any safety device, such as fuses, circuit breakers, interlocks, ground straps, switch covers, and three-prong plugs, without your instructor's permission.
10. Turn off all electrical power before leaving the work area.
11. Follow all instructions, step by step, even if you have performed the laboratory procedure before.
12. Use good judgment and common sense in everything you do.

This list does not include every safety rule for every situation. Not all of the rules will apply every time you work around electricity. The list, however, is a good place to start in developing your personal and laboratory safety habits. The more you learn about electronics, the more you can add to the list of rules. And always:

-- **THINK SAFETY!** --

REMEMBER --

- ◆ **Be alert.**
- ◆ **Be careful.**
 - ◆ **Use common sense.**
 - ◆ **Follow good safety habits.**

SUMMARY

This lesson has introduced you to the world of electronics. This summary reviews the important points covered in the lesson.

- ◆ Electronics offers you many interesting and exciting careers.
- ◆ The science of electronics goes far back in history. Important steps in the evolution of electronics are:
 - Early man puzzles over a mysterious force of attraction.
 - Man discovers the principles of magnetism and electricity.
 - Man learns to use electricity as a useful tool and electricity moves from the laboratory into our homes.
 - Man advances, from vacuum tubes, to transistors, to microchips, and to amazing devices made possible by miniaturized circuits.
 - Man continues to expand his knowledge, skills, and capabilities in electronics.
- ◆ The objectives at the beginning of each lesson tell you what is most important for you to learn in that lesson.
- ◆ Lesson subject discussions explain the theories and concepts of why things happen the way they do in electronics.
- ◆ Experiments provide you with the opportunity to test and prove the theories and concepts you learn.
- ◆ Exercises and tests measure what you have learned and pinpoint areas where you might need extra help.
- ◆ Safety is your own personal responsibility.
- ◆ Warnings and cautions call attention to possible dangers. Pay attention to all warnings and cautions.
- ◆ Know the personal and laboratory safety rules so well that you practice good personal and laboratory safety habits instinctively.