DVD-11C
General Safety in Electronics Assembly

Below is a copy of the narration for DVD-11C. The contents for this script were developed by a review group of industry experts and were based on the best available knowledge at the time of development. The narration may be helpful for translation and technical reference.

Section 1

Safety is a regular part of our lives. Whether we are aware of it or not, we are constantly making safety decisions in this fast-paced and often hazardous world we live in.

Every time we drive a car, cross the street, grab hold of a handrail or pull dinner out of the oven… we are applying safety rules that we have learned somewhere in the past - often without even thinking about it.

When we learn something new, a new set of safety rules usually goes along with the lesson. Certainly, when we learned to drive a car, a large part of that process was learning the rules of the road; which is the set of rules that allows us to safely share the road with others.

When learning a new job in Electronics Assembly, there are a variety of safety lessons to learn here as well. Some of the equipment you'll be using needs to be handled carefully; some of the materials you'll use may be hazardous; and you will need to protect yourself from being injured while doing your job.

In this video, we'll first look at clothing and other personal protection that you will use to guard against injury. Next, we'll consider the safest ways to move and lift while working. Then we'll look at the proper ways to handle the various tools and materials you may use in the assembly process. Finally, we'll look at some housekeeping rules which will help keep your work area clean and safe.

Let's begin with clothing and personal protection – starting with long hair. Hair worn longer than six inches can be both a safety and an ESD hazard. Long, unrestrained hair can be unsafe. It may get tangled or caught in moving parts inside of assembly equipment - causing serious injury.

Long, free-flowing hair can also create static electricity charges which can damage assembly components. For complete information on controlling ESD, refer to IPC-DVD-54C.

To avoid ESD and safety problems, long hair needs to be restrained with hair ties, pins or a hair net. Once you've tied up long, flowing hair, you may still need to secure it to keep it from moving around. You can place it inside your smock, or fasten it to the back of your head.

Loose clothing can also be a safety and an ESD hazard. Long folds of clothing moving around can create static charges, get caught in equipment or just plain get in your way as you work. Avoid clothing with long, loose sleeves. Pin down ties and scarves or keep them completely under your work smock.

Long, dangly jewelry, like long earrings or large, loose bracelets can also be dangerous around some equipment. If one of these earrings was to get caught inside this wave solder machine, the results could be serious injury, electrical shock or burns.

Many assembly jobs have potential eye hazards. Clipping leads, for instance, can create tiny flying pieces of metal which could injure your eyes. You also need to protect your eyes when soldering or working around automated assembly equipment.

Safety glasses are required in many assembly areas to protect against eye hazards. In some plants eye protection is required in all material processing areas.

Safety glasses usually include side shields for additional protection. It's a good idea to clean your glasses at least once a day, and replace them if they become pitted, severely scratched, or if the frames are broken.

Your job may also require that you wear safety shoes. These shoes protect your feet with solid construction and steel toes.

In other, less hazardous work areas, safety shoes may not be required, but you may be required to wear closed-toe and flat-heeled shoes. Closed-toe shoes are designed to protect your toes from various minor foot hazards in your work area, while flat heels will help prevent your shoes from getting caught in open floor grates.

Next, let's look at ways to safely move and lift while on the job. Learning some simple rules about movement and lifting can protect you from a variety of minor and not-so-minor injuries.

There are certain repetitive actions or movements in the assembly process which if performed incorrectly -- may put you at risk for developing what are called "Cumulative Trauma Disorders". Your elbows, shoulders, trigger finger, back and neck are all parts of your body which may develop this condition.

Simply put, cumulative trauma disorder is a physical condition which occurs when you perform a simple task over and over in a way which slightly hurts some part of your body, usually a joint, such as your wrist. These repeated little traumas can, over time, lead to bigger problems.

There are two ways to reduce the likelihood of developing a cumulative trauma disorder in your workstation. The first is to adjust your workstation and the second is to adjust yourself. Adjusting your posture and the way you do your job is a big part of working safely. Simple things like sitting up straight - which keeps your back neutral - keeping your feet flat on the floor or a foot stand . . . and not twisting into awkward positions when reaching or lifting can all help in avoiding injury.

If you are standing for long periods, shift your weight from one foot to another from time to time. This helps to relieve stress on your back. You should also adjust your workstation so that everything you need can be reached without leaning, twisting or over-extending. A good technique is to arrange all your tools and workplace items in a arc around you, so that you're always reaching the same distance for everything. Also, make sure your chair is at a height which allows your hands and wrists to be straight when working.

By far the most common joint to suffer cumulative trauma disorder is the wrist. There are ways to lower your risk of wrist injury – and to avoid injury altogether. The first is to keep your wrist in a neutral position when using any tool. What this means is don't use your wrist in a bent or twisted position. Instead, try to keep your wrist straight - in line with your hand - to avoid pinching your wrist. You may need to reposition your work in order have your hand and wrist in the proper position.

Also, grip each tool as they were designed to be held. If a tool is supposed to be held with the whole hand, don't grip it with just the thumb and index finger. This puts a lot more pressure on your wrist. Only grip with the thumb and forefinger those tools which are designed to be held that way - usually smaller instruments like soldering irons and small picks. And avoid holding objects the same way for long periods of time. Try to rest your hands and change the way you hold things.

Another good preventative measure for your wrists, as well as your entire body, is to do some simple stretching exercises each day. The person responsible for safety in your company should be able to recommend a series of stretches for the arms, hands and wrists -- as well as the rest of the body. Stretching often and everyday relaxes tension which builds up in muscles and is good way to not only prevent injuries but to relieve stress too!

There is a right and wrong way to lift objects. Make sure when you have to lift an object, you lift the right way. Most companies have policies that describe the amount of weight and in some cases even the kinds of objects you are allowed to lift.

When you have to pick up a heavy object use the correct lifting posture… bend at the knees (not the waist) and get close to the load. Tighten your stomach muscles, and with your back straight, stand up. Don't bend your back - let your legs do the lifting. Above all, don't lift and twist at the same time. This is the shortest path to back injury.

Also, try to keep the distance you reach as small as possible. The further you have to reach in order to lift, the more stress you put on your back. For example, lifting a 5 pound object at arms length creates 10 times that amount of stress on the lower back - it's like lifting 50 pounds! If

necessary, rearrange the task so that you can be close to the object.

Try to store items on shelves whenever possible, keeping commonly-used items closest and at waist level. And remember to lift heavy objects with your legs, keeping your back as straight as possible.

Section 2

Next, let's look at some of the tools and materials commonly used in the assembly process that present some form of safety hazard. The scalpels you may use in some rework jobs are extremely sharp and can cut your skin quite easily. They must be used carefully and stored securely when not in use. The number one rule when cutting is "always cut away from your body."

As obvious as it sounds, soldering irons are quite hot - sometimes at temperatures nearing 800 degrees F. The tips can cause serious burns after only being in contact with your skin for a fraction of a second. They can easily burn you through your clothing as well.

Pick up soldering irons by the handle only. A soldering iron should only be in your hand when you are actually using it to solder. Never use one as a screwdriver or scraper, or worse still, as a pointer in a conversation.

To remove excess solder from the iron tip, wipe the tip on the cleaning sponge. Avoid flipping the molten solder off the tip.

During soldering, the smoke or fumes which are created contain a mixture of noxious gases, including formaldehyde and hydrochloric acid.

Workstations where a lot of soldering is done should be well ventilated… or equipped with some form of local exhaust ventilation, or LEV.

An LEV will suck the solder smoke from your breathing zone and vent it away, leaving clean air for breathing.

Lead Free Solders are commonly used for hand soldering these days – which reduces potential exposure to lead. Although some companies still use tin-lead *and* lead free solder for different product types. It’s best to practice common safety precautions regardless of the type of solder you might be using.

Ingestion is the most likely form of exposure to lead during electronics assembly. To avoid ingesting lead, never bite off solder wire with your teeth. Gloves are recommended for handling tin-lead solder wire or solder paste.

One common way of accidentally ingesting lead is touching food, cigarettes, chewing tobacco or makeup after handling tin-lead solder or solder paste. To avoid this problem, always wash your hands in soap and water before touching any item which will come into contact with your mouth or nose such as food or cigarettes.

Tin-lead solder paste also needs to be handled carefully. Lead in the tiny solder balls can get on your fingers or under your fingernails. The lead in tin-lead solder paste is made of particles so small that they could potentially be absorbed into the skin if exposed to high enough pressure. Never use compressed air to remove solder paste from your skin or clothing.

Wave solder machines – using tin-lead solder - also have potential lead risks, especially during maintenance. Always follow your company's safety guidelines whenever you service a wave solder machine… whether simply adding solder bars… removing dross… or performing more complex maintenance. These safety guidelines usually include wearing the correct gloves, clothing and eye protection and an approved respirator.

Most assembly jobs include working with at least some hazardous chemicals. A Hazardous Chemical is any chemical which can cause physical harm or appears on a hazardous chemical list, such as the one produced by OSHA (the Occupational Safety and Health Administration). If your job involves handling hazardous chemicals – or working in an area which includes these chemicals – you will receive additional training in the following areas:

You'll learn the physical and health hazards of the hazardous chemicals and how to read the labeling system they use.

You'll learn how to protect yourself from hazardous chemicals.

And, you'll learn ways to detect the presence of a hazardous chemical in your work area.

In particular, you'll learn about the Hazardous Materials Classification system and the Haz-Mat sign. This familiar diamond-shaped sign shows the level of health hazard of a material; how flammable it is; the material's reactivity, and any specific hazard associated with the material, such as USE NO WATER.

You'll also learn about Material Safety Data Sheets that are produced by the manufacturer of a hazardous product. They contain specific information about the product and how to handle it safely. Material Safety Data Sheets must be available in your work area for all hazardous materials used in that area. You are required to read and understand them.

Speaking of hazards, another important safety concern involves evacuating the area in the event of an emergency. You will need to know both primary and secondary evacuation routes. If there’s something you don’t understand about how to exit the building, please ask your supervisor.

But the cornerstone of personal safety in the workplace is as simple as good housekeeping. A good way to keep your work area safe is to keep it clean and neat. A messy work area is an unsafe work area. The only items on your bench top should be those you need to do your job.

Your workstation should always be kept organized with the bench top free of debris) especially solder drippings and clipped leads. Waste material should be thrown away according to the correct procedures for your area. Aisles and passageways around your work area should be kept

clear so others can move safely through them. Something as simple as a sheet of paper on a tile floor can be a real hazard.

Be on the lookout for safety hazards and report any unsafe condition to your supervisor right away. If the problem can be immediately corrected by you, then take care of it yourself.

Pay particular attention to the many electrical cords on and around your workstation. Power cords can be easily melted by soldering irons – leading to electrical shorts. You could get shocked or even start a fire. Tag any item with a damaged electrical cord and report it to maintenance.

Don't use any electric tool which has frayed or exposed wires or a faulty plug. When unplugging a tool always pull by the plug itself - not the cord - which can damage the plug and lead to trouble. And only use tools and equipment with three-prong plugs. The third prong is a ground which helps protect you.
If you detect an unusual smell, don't ignore it, check with your coworkers and report it. If you see sparks around a plug or piece of equipment there may be a dangerous overload. Contact your supervisor immediately.

Another part of good housekeeping is observing all of the warning systems which your facilities, engineering, or safety personnel will use to warn you to avoid equipment or a specific area. These warning systems are the lockout - a label and lock which disable a piece of equipment; the tagout - a red tag warning that the equipment is not to be used; and the tape off - yellow caution tape around an area which is temporarily off limits during repair.

In this video, we examined the rules of safe conduct you will need to follow to protect yourself on the job. We looked at clothing and personal protection -- to guard against injury. We reviewed the safe way to move and lift while working. And we explored the proper ways to handle and store the various tools and materials used in the assembly process.

The information presented here has been designed as an introduction to the specific safety policies and procedures at your company. You'll be given in-depth training on those safety policies and procedures as they apply to the specific jobs you'll be doing in electronics assembly.

A safe work environment doesn't just happen. Together with your company, you must make it happen. Safety begins with you.