SAFETY TRAINING

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MACHINE GUARD SAFETY

Leader's Guide, Fact Sheet & Quiz

Item Number: 3101

This easy-to-use Leader's Guide is provided to assist in conducting a successful presentation.

PREPARING FOR THE MEETING

Here are a few suggestions for using this program:

a) Review the contents of the Fact Sheet that immediately follows this page to familiarize yourself with the program topic and the training points discussed in the program. The Fact Sheet also includes a list of Program Objectives that details the information that participants should learn from watching the program.

b) If required by your organization, make an attendance record to be signed by each participant to document the training to be conducted.

c) Prepare the area and equipment to be used for the training. Make sure the watching environment is comfortable and free from outside distractions. Also, ensure that participants can see and hear the TV screen or computer monitor without obstructions.

d) Make copies of the Review Quiz included at the end of this Leader's Guide to be completed by participants at the conclusion of the presentation. Be aware that the page containing the answers to the quiz comes *before* the quiz itself, which is on the final page.

CONDUCTING THE PRESENTATION

a) Begin the meeting by welcoming the participants. Introduce yourself and give each person an opportunity to become acquainted if there are new people joining the training session.

b) Introduce the program by its title and explain to participants what they are expected to learn as stated in the Program Objectives of the Fact Sheet.

c) Play the program without interruption. Upon completion, lead discussions about your organization's specific policies regarding the subject matter. Make sure to note any unique hazards associated with the program's topic that participants may encounter while performing their job duties at your facility.

d) Hand out copies of the review quiz to all of the participants and make sure each one completes it before concluding the training session.

3101 MACHINE GUARD SAFETY
FACT SHEET

LENGTH: 17 MINUTES

PROGRAM SYNOPSIS:
Machinery - its power enables us to do more and heavier work than we could ever hope to do on our own, but there's a price to pay for all of this added productivity. Roughly 15,000 machine-related accidents happen every year. They not only cause severe injuries, such as amputations, lacerations, crushing and abrasions, they result in hundreds of fatalities as well. Yet most of these incidents could have been prevented by machine guards and other safety devices. Machine guards are designed to keep employees clear of mechanical danger zones and protect them from hazards like flying sparks, particles and "kickbacks". This program explains how machine guards and safety devices work as well as safe work practices employees can follow to work safely with powered equipment.

PROGRAM OBJECTIVES:
After watching the program, the participant should be able to explain the following:
- Understand the types of hazards associated with machines that have exposed moving parts;
- Know the areas of a machine where its moving parts create potential hazards;
- Know the types of machine guards that are used to reduce these hazards;
- Understand how these machine guards work;
- Understand the special fitting requirements that are needed by restrain and pullback devices;
- Know safe work procedures they can use to reduce machine-related hazards.

PROGRAM OUTLINE:

BACKGROUND
- Machinery - its power enables us to do more and heavier work than we could ever hope to do on our own.
- But there's a price to pay for this added productivity, because the more powerful and capable a piece of equipment is, the greater the danger it can pose to the people who use it.
- The hazards are very real. Roughly 15,000 machine-related accidents happen every year.
- They not only cause severe injuries, such as amputations, lacerations, crushing and abrasions, they result in hundreds of fatalities as well.
- Most of these incidents could have been prevented, by machine guards and other safety devices.
- Machine guards are designed to keep you clear of mechanical danger zones, and protect you from hazards like flying sparks, particles and "kickbacks".
- In this program we'll take a closer look at the safeguards and work practices you need to use to work safely with powered equipment.

DANGEROUS MECHANICAL MOTIONS
- To help us understand the potential hazards of working with powered equipment, let's look at the different motions a machine can make.
- All machinery operates using a combination of three basic motions: rotation, reciprocation (moving back and forth) and transverse motion (moving in a straight line).
- These movements can also be combined to produce what is known as "articulated motion".
- This can be especially dangerous, because articulated motion makes it hard to predict which way a machine's parts will move.
- There are three areas where a machine's moving parts can create potential hazards: Within the "drive train" (the moving parts that run the machine), at the machine's "perimeter" (the area around a machine where a worker could be injured by flying debris and other hazards) and at the "points of operation" (where the machine's mechanical energy is used to cut, bend, move or otherwise process materials).

FIXED AND INTERLOCK GUARDS
- How can we protect ourselves from the hazards that powered machinery generates? That's where safety guards and

safe work practices come into play.

- There are four types of "guards" that are used on most machines.
- "Fixed guards" are the oldest and simplest type of machine guard. They include wire cages, clear plastic shields, and metal covers, which create permanent protective barriers.
- Drive trains are almost always protected by fixed guards. Often the guards are built into a machine's housing, to fully enclose the drive train's moving parts.
- Fixed guards are sometimes used around a machine's "perimeters" and at "points of operation" as well. Since fixed guards are permanent, they must be positioned where they will not interfere with a worker's ability to access or operate the machine.
- In situations where fixed guards wouldn't work well, "interlock guards" are often used. These guards use an electronic sensor that will not permit a machine to run unless the guard is in place.
- This provides workers with complete protection, while at the same time enabling safe access to all of the areas in and around the machine.
- When an interlock guard is opened, the sensor trips a relay switch that shuts off the machine's power. When the guard is closed, power is restored, and the machine can once again be operated.
- While fixed and interlock guards can greatly reduce the number of accidents around machine drive trains and perimeters, other measures are often required to prevent accidents at "points of operation". Accidents are common at these points because workers are often only inches away from a machine's moving parts.

ADJUSTABLE & SELF-ADJUSTING GUARDS

- It's extremely important to use machine guards at these locations, but at the same time, the guards cannot be allowed to interfere with operating the machine. For this reason, "adjustable" and "self-adjusting" guards are frequently used in these situations.
- Adjustable guards can be moved by the machine operators themselves, to suit their needs... such as when they are working on objects of different shapes and sizes.
- Self-adjusting guards move automatically, as material makes its way through the machine.
- Because of the way that they work, these types of guards must be inspected before each use, as well as every time there is a change in a machine's set-up.
- It's particularly important to make sure that the guards are properly adjusted, so that materials of various sizes can pass through without binding or kicking back.
- Adjustable and self-adjusting guards must never leave gaps or openings that are large enough for any body part to fit through.

LIGHT CURTAINS

- There are some situations where even adjustable and self-adjusting guards can interfere with a worker’s ability to run a machine. This is when "safety devices" should be employed. They can protect workers in several different ways.
- "Light curtains" are the most common type of safety device. They are photoelectric systems that use beams of fluorescent or infra-red light to create "invisible barriers" around machine perimeters, and in front of points of operation.
- If something breaks one of these barriers, a relay switch is tripped, and the machine's power is cut off.
- By reflecting the beams of light onto a series of mirrors, a "curtain of protection" can be created around a machine's perimeter. This keeps workers from getting close to hazards associated with any part of the machine, while allowing for a clear view of all operations.
- At points of operation, light curtains are often set up so that raw materials that are being fed to the machine will not trigger a shutdown.
- If the light curtain permits a finger, hand or other body part to pass through it without shutting down the machine, it is not set up properly. It must be readjusted before someone gets hurt.
- It's essential that any machine using light curtains comes to a complete stop immediately after the curtain is tripped, because a worker can still be severely injured by parts of the equipment that are "grinding to a halt”.
- A machine that is protected by a light curtain must have its stopping time checked periodically by a qualified technician, using special testing devices. If the machine is not stopping quickly enough, simple adjustments to the light curtain or the machine's braking mechanisms will usually fix the problem.

PRESSURE-SENSING DEVICES

- "Pressure-sensing devices" are another type of device that is used to protect workers by stopping a machine's movements.
- “Trips" and "mats" are two types of pressure-sensitive devices. Both are positioned around machines, to keep workers from entering hazardous areas.
- Pressure-sensitive trips usually use wire cables as "safety lines". If a worker touches one of these lines it triggers a switch that stops the machine. In order for trips to be effective, the cables must be taut, and adjusted so that they will stop the machine at the slightest pressure.
- Because the cables can cover a wide area, pressure-sensitive trips are ideal for covering long distances, such as next to conveyor belts. By routing the cables through eyelets, trips can also be used to protect unusually shaped machine perimeters.

PRESSURE-SENSITIVE MATS

- "Pressure-sensitive mats" are another device that is frequently used to protect irregularly shaped machine areas.
- Because they are "movable" they provide more flexibility than "trips". These mats have weight-triggered sensors in them. In most cases, when someone steps on the mat, a relay switch immediately cuts the power and stops the machine.
- But pressure-sensitive mats can also be set up to shut the machine down if the operator steps off of them. Used this way, they protect workers by forcing them to remain in a safe position while they operate the machine.
- Whichever way pressure-sensitive mats are used, they must be located directly in front of the areas where workers would be putting themselves in danger. And as with light curtains and "trips", if there is any doubt about whether a machine is shutting down quickly enough, the machine and mat must be checked by a qualified technician.
- The safety devices that we've talked about so far protect all parts of the body, but there are other devices that have been designed to specifically protect the hands. These are used on machines where workers are directly exposed to hand and finger injuries.

TWO-HAND CONTROLS & DROP PROBE DEVICES

- The simplest way to protect a worker's hands is to make sure that they are out of danger before a machine can start.
- "Two-hand controls" accomplish this by requiring the machine operator to push two separate buttons at the same time in order to activate the machine. This keeps the operator's hands safely on the controls, and away from moving parts.
- On some machines a "drop probe device" can be used to allow workers to safely hold materials at a point of operation. A drop probe is a small metal shaft that "drops" to a predetermined spot an instant before a machine starts.
- If the shaft falls freely, the machine begins its movement. If the shaft hits a worker's hand or some other obstacle, the machine will not start up.
- One drawback of "drop probe" devices is that they can only keep a machine from starting, and do not stop a machine that is already in operation. For this reason, they must only be used on machines such as small riveters that perform a single, rapid movement each time they're activated.

RESTRAIN & PULLBACK DEVICES

- "Restrain and pullback devices" are another type of hand protector. Unlike other guards and devices they are attached to the workers that they protect.
- Restrain devices use short straps or cables that are attached to an operator's wrists. These protect workers by preventing their hands from extending into the point of operation of the machine that they're using.
- To be effective, the cables must be long enough for a worker to manipulate the materials that are being used in the machine but short enough to prevent their hands and fingers from entering the danger zones.
- Pullback devices on the other hand permit machine operators unrestricted access to a point of operation between machine movements. If their hands are too close to the point of operation when the machine starts moving, the devices will "pull their hands back”.
- Because everyone is a different size and shape, it is crucial that "restrain" and "pullback" devices are set up and adjusted for each worker who uses them. What may be a proper setting for one person could be uncomfortably restrictive or dangerously loose for another. It's extremely important for the operator to inspect and adjust these devices before each use.

USE OF MULTIPLE DEVICES

- While each type of device we've discussed can be used by itself, in many cases there will be several types of guards and devices on a single machine.
- Using multiple devices is particularly important when any single device does not completely protect workers from all of a machine's hazards.
- For instance, a worker may wear a restrain device to protect his hands while he operates an electrical spot-welder, but the machine must also be shielded to prevent him from being hit by sparks and hot fragments and guarded to keep him clear of its high-voltage components.
- For instance, an electrical spot-welding machine might have a transparent guard to prevent the operator from being hit by sparks or hot fragments.
- A pressure sensitive mat that allows the equipment to function only when the operator is standing clear of its moving parts and fixed guards to prevent unauthorized persons from coming too close to the machine’s high-voltage power source.

SAFE WORK PRACTICES

- Unfortunately, even if a machine has had guards or safety devices installed on it at one time, that doesn't always mean that it is still safe to work with. So it's essential to follow "safe work practices" at all times, as well.
- Many accidents occur on machines that have had their safety guards and devices damaged, altered or even removed. It is important to check that they are still installed and working correctly. Do not operate the machine if they are not.
- It's also important to wear personal protective equipment, such as safety glasses and face shields, to protect yourself from sparks and flying material that may make their way past a machine's guarding.
- You should also never use a machine if you are sick, tired or having trouble concentrating. Your full attention is required to avoid accidents.
- Keeping your work area clean, and free of tools, materials and debris is essential as well. Any of these could fall into your machine, hit moving parts, and become projectiles.
- Dress carefully, because loose clothing, long hair, and jewelry can slip past a safety guard, get wrapped in moving parts, and pull you into the machinery. So wear tight-fitting clothing whenever possible. Make sure to tuck in shirts, and button sleeves.
- Keep your hair back, and always remove jewelry. Wedding bands and other rings can often cause problems, since it's easy to forget to take them off.
- Most importantly, maintain a healthy respect for the machinery you work with. Many serious accidents happen to experienced workers, because they become complacent and decide that they can get away with dangerous shortcuts.

MACHINE GUARD SAFETY

ANSWERS TO THE REVIEW QUIZ

1. d
2. b
3. b
4. a
5. c
6. a
7. b
8. b
9. a
10. a

MACHINE GUARD SAFETY
REVIEW QUIZ

Name_____Date_____

The following questions are provided to determine how well you understand the information presented in this program.

1. Which of the following areas of a machine's moving parts can create potential hazards?

a. Drivetrain
b. Perimeter
c. Points of operation
d. All of the above

2. Wire cages are a type of interlock guard.

a. True
b. False

3. Drivetrains are almost never protected by fixed guards.

a. True
b. False

4. You should always remove jewelry when operating a machine.

a. True
b. False

5. Which of the following are not pressure-sensing devices?

a. Trips
b. Mats
c. Light curtains

6. A drop-probe device can only keep a machine from starting.

a. True
b. False

7. There is no risk of injury at the perimeter of a machine because no moving parts are located there.

a. True
b. False

8. Stepping onto a pressure-sensitive mat will always shut down the machine it is guarding.

a. True
b. False

9. "Restrain" and "pullback" devices must be set up and adjusted to fit each worker who uses them.

a. True
b. False

10. Even when the machinery that you're using is fully equipped with guards and safety devices, it's still essential to follow safe work practices.

a. True
b. False