



## ***ABOUT PERSONAL FALL ARREST SYSTEMS***

**LENGTH: 14 MINUTES**

### **PROGRAM SYNOPSIS:**

Our workplace is full of hazards, hazards that can hurt us or kill us. Controlling these hazards and preventing injuries is the point of our safety and health program. One such hazard is presented by elevated working surfaces where there is the potential for a fall. Should a fall occur, the proper use of a personal fall arrest system can prevent injuries and save lives. That is the point of our facility's fall protection program and that is the point of this program. So, pay close attention as we get to the point about personal fall arrest systems.

Topics include the full body harness, connecting devices, anchor points, calculating total fall distance, safe use of self-retracting lifelines and planning for survival and rescue after a fall event.

### **PROGRAM OBJECTIVES:**

After watching the program, the participant will be able to explain the following:

- How to properly inspect and put on a full body harness;
- How to select, inspect and connect a connecting device properly;
- Why anchor points must be verified and approved;
- How to calculate the total fall distance;
- How to use self-retracting lifelines properly;
- Why it is important to plan for rescue and survival after a fall event.

### **BACKGROUND**

- Working above ground comes with increased risk because of the possibility of a fall. To prevent falls, our organization maintains proper guardrails and handrails on all commonly-used elevated work areas, stairs and platforms.
- When it becomes necessary for workers to venture beyond the protection of these guardrails and perform elevated work, a personal fall arrest system will be required.
- Our organization's plan for the use of personal fall arrest systems incorporates current workplace safety and health regulations as well as the best practices developed by other leading authorities in the area of fall arrest systems and fall protection.
- For our fall protection program to be effective, employees must understand and follow safe work practices for working above ground, which includes the proper selection and use of a personal fall arrest system.

### **THE FULL BODY HARNESS**

- A personal fall arrest system consists of three essential components: a full-body harness, a connecting device and an anchor point.
- During a fall, a properly worn body harness will help safely distribute the forces generated by the fall to various points on the body. This greatly reduces the risk of injury.
- Before using a harness, it must be thoroughly inspected. Check for deformed or bent buckles or D-rings, frayed or torn stitching and damage to the harness' webbing.
- Also, look for any indication that the harness has been exposed to forces of a fall. Harnesses exposed to a fall or those that are damaged must be removed from service.
- To make it easier to put on the harness, it's a good idea to hold it by the D-ring located on the back of the harness and gently shake it, so the harness falls into shape.
- To don the harness, slip your arms through the shoulder straps using the same motion as if putting on a jacket and then secure the chest strap.
- Some harnesses have a permanently-connected chest strap. If this is the case, you'll have to put your head through the hole and don the harness using the same motion as if putting on a T-shirt.
- Complete the donning of the harness by pulling the leg straps around your legs and securing them snugly. The harness should be worn with a snug and secure fit. A harness worn loosely can cause painful injuries during a fall.

### **CONNECTING DEVICES**

- After donning your body harness, you will need a connecting device, often called a lanyard, to attach your body harness to an approved anchor point.
- There are various types of lanyards and it's important to select one appropriate to your specific application. The single lanyard is the most common connecting device, but there are also Y-shaped lanyards that allow movement between anchor points and retractable lanyards that limit the distance of a fall.

- In order to prevent serious injury, the fall arrest system must limit the amount of force exerted on the worker during a fall event.
- One method used to achieve this reduction in force is to limit the distance a worker falls. This can be achieved by using a retractable lanyard or fall-limiting device.
- A fall-limiting device will allow the lanyard to move freely as work is being performed, but will quickly lock should a fall occur. Most of these devices will stop a falling worker within two feet or about 60 centimeters.
- Another type of lanyard designed to reduce the force of a fall is an “energy-absorbing” lanyard often called a “shock-absorbing” lanyard. This type of lanyard is designed to absorb the energy of a fall by stretching and elongating a specially designed segment; the amount of elongation is limited to 3½ feet or about one meter.
- No matter what type of lanyard you select, it must be rated to support 5,000 pounds or about 2,270 kilograms. It must display a stamp or tag from the manufacturer confirming this rating.
- The lanyard must also be inspected prior to use. Look for torn or frayed stitching, tears, cuts, burns or chemical damage.
- Also, a lanyard must not have any type of knot tied into it. Knots will reduce the strength of a lanyard.
- Inspect the snap hook and keeper gate for cracks, bending or distortion. Look for indications that the lanyard has been subjected to the force of a fall such as elongation or torn stitching.
- Some lanyards and fall limiting devices will display a fall alert indicator or tag if they have been exposed to a fall. If you discover any damage to your connecting device or any indication that it has been exposed to the force of a fall, it must be removed from service.
- Regulations require that all connecting devices must utilize a double-locking snap hook. A double-locking snap hook requires two separate actions to release the keeper gate. This is an important safeguard to prevent an inadvertent opening of the hook.
- Snap hooks should only be connected to compatible devices designed by their manufacturer for this intended purpose.
- Most lanyards are not designed to be passed over an object and connected back onto itself. This reduces the holding strength of the lanyard by half and also exposes the lanyard to being cut or damaged by sharp edges if a fall were to occur.
- To protect your lanyard from damage and maximize its holding strength, use a beam strap or other specialty device specifically designed for this purpose.

### **THE ANCHOR POINT**

- The third and final component of your personal fall arrest system is the anchor point. Regulations require that an anchor point used as part of a fall arrest system be able to support 5,000 pounds, or about 2,268 kilograms, of dead weight per person connected to it.
- Conduit, hand rails and similar items aren't strong enough to be used as anchor points.
- The weight capacity of any anchor point used as part of a fall arrest system must be verified by a qualified person.
- It is your responsibility to know which structures have been verified and approved as anchor points. If you are unsure how to locate a proper anchor point, stop and seek assistance before proceeding.
- The anchor point must always be located at or above the height of the D-Ring on your harness. Allowing the anchor point to be below the height of your D-Ring adds additional distance to the length of your fall, which can result in injury or equipment failure.

### **CALCULATING THE TOTAL FALL DISTANCE**

- Remember that the main point of using a personal fall arrest system is to prevent you from hitting the ground. This is why you must be able to calculate the total fall distance of any potential fall.
- The total fall distance is the maximum distance a worker will fall from the anchor point. To calculate this distance, add your height, plus the lanyard length, plus the maximum elongation length of your connecting device.
- In this example, a six-foot tall worker is using a six-foot long lanyard. If this worker were to fall, the lanyard will elongate an additional maximum distance of 3½ feet. Adding each of these distances together gives us a total distance of 15½ feet.
- You must then add a three foot safety factor to account for any stretching of the harness straps and other variables. This then yields a total fall distance of 18½ feet or about 5.7 meters. What this means is that this worker's anchor point must be at least 18½ feet or 5.7 meters above the ground in order to work safely.
- If you are ever unsure about the height of your anchor point, take time to measure it and then compare it to your calculated total fall distance.

### **SELF-RETRACTING LIFELINES**

- Of course, there are many situations where a risk of falling exists below 18½ feet or 5.7 meters. To prevent hitting the ground in this situation, you must either choose a shorter lanyard or use a fall-limiting device.
- A fall-limiting device, often called a self-retracting lifeline, is designed to stop a fall within two feet or about 60 centimeters.
- When using a self-retracting lifeline, make it a point not to move too far away from the anchor point. Moving away from the anchor point can extend the length of the lifeline beyond the height of the anchor point. Should a fall occur with too much line extended you will hit the ground.
- In addition, moving too far away from the anchor point will cause you to swing in a large arc if a fall were to occur.
- Swinging in a large arc can cause you to collide into objects with great force, resulting in injury. To prevent this, a good rule of thumb is to keep your retracting lifeline within a 15-degree angle to the vertical at the anchor point.

### **USING FALL ARREST EQUIPMENT 100 PERCENT OF THE TIME**

- The proper selection and use of each component of your personal fall arrest system is equally important in arresting a fall, but none of it does you any good if you don't use it. When working above ground, make it a point to use your fall arrest system 100 percent of the time that you are exposed to a fall hazard.
- Many severe injuries and deaths occur each year when workers, who are wearing a harness, fail to connect it to the anchor point when they reach the elevated working surface.

- Other casualties occur when workers disconnect their lanyard to move from one anchor point to another. When you must move from one location to another, use a Y-shaped lanyard to connect to the new anchor point before disconnecting from the current one.

### **RESCUING FALL VICTIMS/SURVIVING A FALL EVENT**

- It takes a lot of planning to properly select and use a fall arrest system, but to safely survive a fall event, an equal amount of planning must be devoted to rescuing a fall victim after a fall has occurred.
- A prompt rescue must be made because hanging in a harness for an extended period of time can result in injury or death due to orthostatic intolerance, often called "suspension trauma."
- Before beginning any work requiring the use of a fall arrest system, a rescue plan should be created. This plan should ensure that proper equipment, capable of reaching the victim, is readily available or that a properly trained rescue team is nearby and available to be summoned.
- Suspension trauma occurs when a large portion of the body's blood accumulates in the legs due to gravity, the lack of movement and the pressure applied by the harness' leg straps. This pooled blood gradually reduces the amount of blood available for circulation to the brain and vital organs. This leads to loss of consciousness, vital organ damage and eventually death.
- While waiting to be rescued, you can help prevent suspension trauma by periodically pumping your legs up and down to help return the pooled blood back into circulation.
- Also, there are simple devices available that, when connected to your D-ring, will allow you to stand and straighten your legs. This removes some pressure from the leg straps and makes it easier for the blood to circulate properly.
- Of course, you will have to have planned in advance to ensure that this device is handy and accessible when you need it.

## TO THE POINT ABOUT PERSONAL FALL ARREST SYSTEMS

### Review Quiz

Name \_\_\_\_\_ Date \_\_\_\_\_

*Please provide answers to the following to show how well you understand the information presented during this program.*

1. Full body harnesses that have been exposed to a fall or that are damaged must be removed from service.
  - a. True
  - b. False
  
2. The amount of elongation of a shock-absorbing lanyard is limited to \_\_\_\_\_ feet.
  - a. 3½
  - b. 5
  - c. 6½
  
3. Snap hooks may be connected to any object of suitable strength provided the hook is able to close properly.
  - a. True
  - b. False
  
4. Regulations require that an anchor point be able to support \_\_\_\_\_ pounds of dead weight per person connected to it.
  - a. 500
  - b. 2,500
  - c. 5,000
  
5. The weight capacity of any anchor point used as part of a fall arrest system must be verified by a qualified person.
  - a. True
  - b. False
  
6. Which of the following must be included in the calculation of the total fall distance?
  - a. The worker's height
  - b. The lanyard length
  - c. The lanyard's maximum elongation length
  - d. A safety factor of three feet
  - e. All of the above
  
7. A self-retracting lifeline is designed to stop a fall within three feet.
  - a. True
  - b. False
  
8. A good rule of thumb is to keep a self-retracting lifeline within a \_\_\_\_\_ degree angle to the vertical at the anchor pint.
  - a. 15
  - b. 30
  - c. 45
  
9. The effects of hanging in a harness for an extended period of time are called orthostatic intolerance, commonly referred to as \_\_\_\_\_.
  - a. Hanging stress
  - b. Suspension trauma
  - c. Dangling shock

*ANSWERS TO THE REVIEW QUESTIONS*

1. a

2. a

3. b

4. c

5. a

6. e

7. b

8. a

9. b