TRITECH
FALL PROTECTION

TRAINING INDEX

MSA
The Safety Company

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Chapter I – System Design

1.1 System Description

Your horizontal fall arrest system has been engineered and designed by a team of professionals to arrest your fall and prevent you from coming in contact with the ground. In the event of a fall, the system will reduce the forces applied to the body to an acceptable level, minimizing the potential for personal injury.

The system consists of a single anchor point, a vertical lifeline, horizontal lifeline, or rigid rail that spans two or more anchorage points. The distance between the anchorage points or the length of the system will vary to as little as 10 ft. to 1500ft. or more. Longer systems will utilize intermediate supports in the design. Systems are normally designed to allow free movement along it's length; allowing the user to pass through the intermediate supports without disconnecting. Horizontal fall arrest systems may consist of stainless-steel cable lifelines or rigid rails. Regardless of the type of system, they are all designed for a maximum number of users and should be used only with the fall arrest devices specified for use with the system.

Fall Arrest Systems must be maintained on a regular basis, inspected often and the user(s) must be trained on how to use the system properly and effectively.

The sub-components on your horizontal fall arrest system will consist of the lifeline (cable or rigid rail) on which will be located the travelling device (transfastener or trolley). Connected to this would be a fixed length shock-absorbing lanyard or a self-retracting lanyard. The free end of the lanyard must be attached to the dorsal "D" ring of a properly fitted full body harness.

1.2 O&M Manual

Your Tritech Fall Arrest System has been designed for your specific application.

Information relative to your system such as:

- Certification of Installation(s)
- Engineering Data
- Number of Users for which the system was designed.
- Component Serial Numbers

can be found in your Operations and Maintenance (O&M) Manual.

Please familiarize yourself with the information contained in this manual. The manual should be stored on site and available for reference and Annual Service Documentation updates.

Chapter II – Anchorage Points

2.1 Single Anchor Points

An anchorage point is a secure location of attachment where a worker may connect their harness. It is usually a structural member, such as an I-beam, rebar, roof structure, concrete, or a wood truss of sufficient strength to withstand fall forces. OSHA gives the employer two options when it comes to selecting an anchorage point that will be deemed to meet its strength requirements. The first of these is a set number:

- Capable of supporting a static load of at least **5,000 pounds (22.2kN) per employee**

Often a worker must perform a task in an area but is unsure about whether the anchor that they would like to select is strong enough; this is where the second option comes in. OSHA says that here the anchor must be designed:

- As part of complete personal fall arrest system which maintains a safety factor of at least two; ***and***
- Under the supervision of a ***qualified person***."

This is where the Tritech Fall Protection comes into play. What OSHA is stating is that this person must analyze the entire personal fall arrest system (PFAS) setup and determine whether the anchorage point would be able to hold at least two times the forces that would be imposed upon it in the potential fall.

OSHA stipulates that a PFAS "must limit maximum arresting force on an employee to 1,800 pounds (8 kN)." This means that if the worker falls, they shall never feel a force of more than 1,800 pounds imposed on their body, which is also the force that the anchor will feel. Many engineers will double this figure of 1,800 pounds, giving a minimum strength of 3,600 pounds for any anchor that they choose.

Anchorage Strengths for the PFPS		
1st Option	• 5,000 lbs. per Attached Worker	"Non-Certified"
2nd Option	• Safety Factor of 2 by a Qualified Person	"Certified" (by a Q.P.)

2.1.1 The Anchorage Connector

Once an anchorage point of appropriate strength is identified, the next question becomes how to connect to it. Since it is impermissible to wrap your lanyard or self-retracting lifeline directly around the point itself (doing what is known as "choke-loading"), you will need to find an anchorage connector that is designed for the type of anchor that you have found.

- Note: ***Choke-loading*** is impermissible with *most* lanyards and SRLs (self-retracting lifelines) because their line was not designed to wrap around rough surfaces that could be damaging. Their snap hooks also were not designed for such a connection.

Anchorage connectors may be classified as *temporary* or *fixed*:

- Temporary – Designed to be installed as needed around the worksite, removing at the end of the job.
- Fixed – Remains in the location where it is installed on a permanent basis for future use.

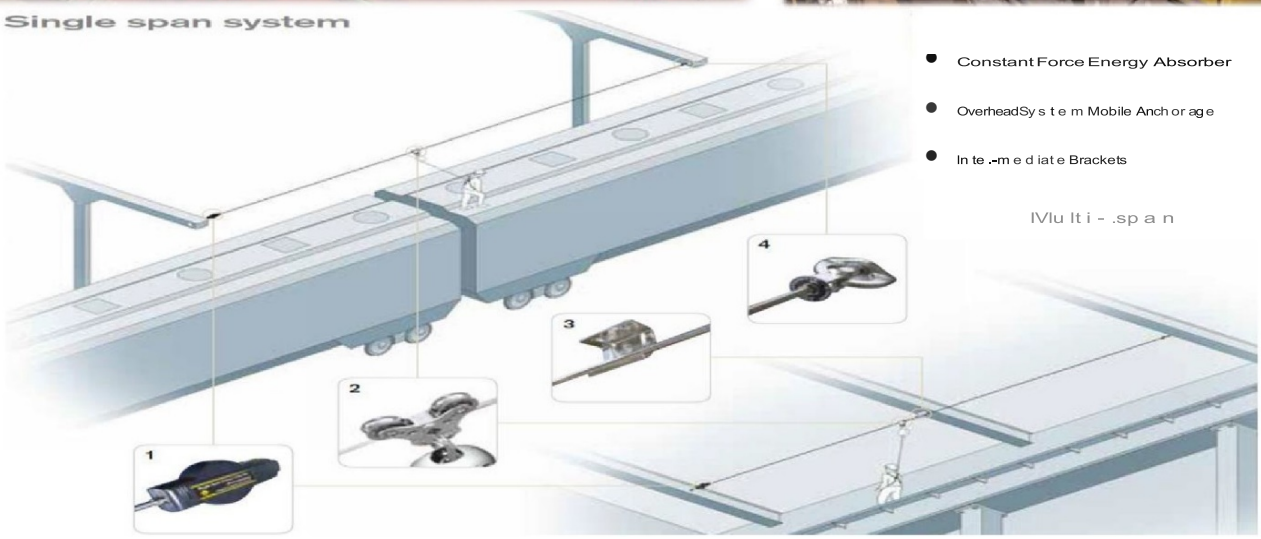
Temporary Anchorage Connectors		
 Cross-Arm Strap	 Sliding Beam Clamp	 Fixed Beam Clamp
 Removable for Concrete	 Friction-Based Connectors	 Reusable Roof Anchor

Fixed Anchorage Connectors		
 D-Plate Connector / MEGA Swivel	 Fixed Roof Connector	 Weld-On Puck

2.2 Horizontal Lifelines

Another type of more complex anchorage connector is what is known as a "horizontal lifeline" (HLL). This is a line that is suspended between two points, giving workers a great amount of horizontal mobility. Common systems are 30 or 60 feet in length to allow for situations where a great deal of side-to-side mobility is needed.

Permanent HLLs can be installed in areas where the worker needs the ability to move around on more of a regular basis. These types of lifelines are installed in a wide variety of different situations, including on building rooftops, in the rafters of sports stadiums, on bridges, and on overhead crane rail runways, or above "rolling stock" such as train cars.



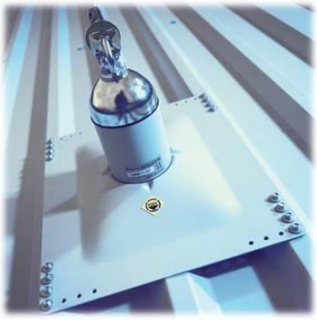
Note: With a more complex anchorage connector such as this, whether it is a temporary "kit" system or a more permanent line, OSHA provides restrictions on who may participate in the design:

"The employer must ensure that each horizontal lifeline is designed, installed, and used ***under the supervision of a qualified person***; and is part of a complete personal fall arrest system that maintains a safety factor of at least two."

2.3 Horizontal Lifelines for Roofs

Providing fall protection on roofs continues to be a topic of significant interest. Here, just like on any other work surface, fall protection of some sort is required. In some cases, for aesthetic reasons or because the roof design will not permit guardrails, many companies have looked for other options for fall protection.

Standing Seam



Composite

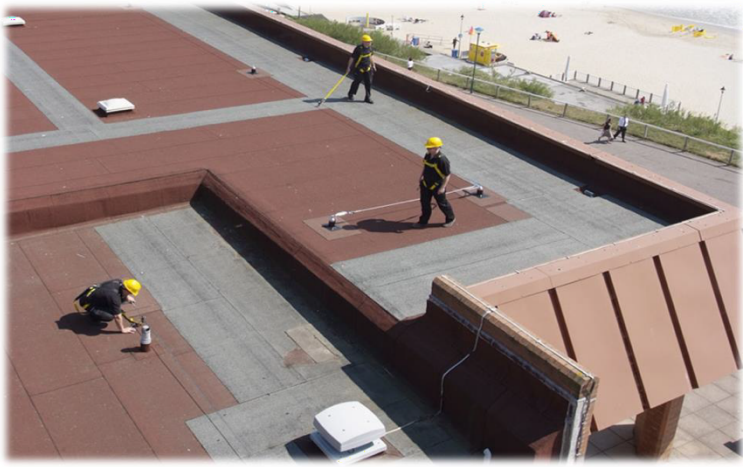
Secret Fix

Membrane

One option that has become more and more common is the installation of fixed anchorage connectors that anchor directly to the roof structure and utilize energy absorber technology (in this case being the Constant-Force Coil) to minimize force imparted on the point of securement in the fall. Attachment in this case depends on the roof type, including fixation through clamps (standing seam), stitching screws (composite roofs), rivets (secret fix), and toggle bolts which penetrate down through the top surface of membrane-style roofs.

Common characteristics include:

- May be a single, fixed anchor point, or united/tied together as a horizontal lifeline.
- Fixation to below roof structure often is not necessary, instead often relying on roof panels themselves.
- May be designed for ***fall restraint*** or ***fall arrest***, based on the level of control wanted / needed.
- Frequently may accommodate multiple users (going up to as many as 5 in some cases)



2.4 Rigid Rail Systems

Some applications call for a rigid rail system rather than a horizontal lifeline. Rigid rail systems are most commonly required due to limited fall distances but can also be a requirement of the location of the installation or the elements that it is exposed to.

Similar to horizontal lifelines, rigid rail systems are installed between two anchor points where the worker requires horizontal mobility. Some common applications for rigid rail systems are to provide access over a truck loading station, aircraft hangars, or over conveyors where the deflection of a horizontal lifeline can exceed the available fall distance.

Another advantage of rigid rail systems is the mobility that they provide. Some of these systems have the capability to be moved into position to provide access to various sizes and shapes of equipment beneath, or in some cases they can be moved completely out of the way and only put into use when coverage is required.

2.5 Vertical Lifeline Systems

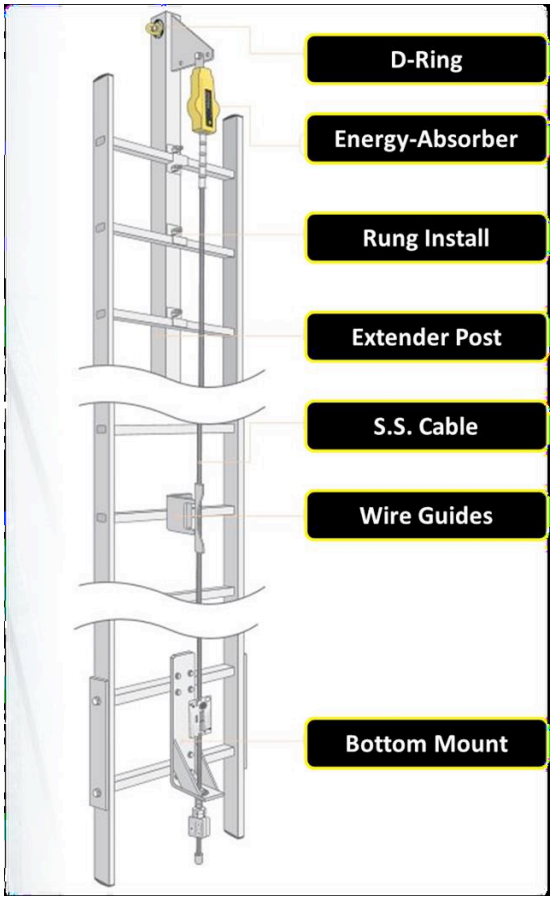
As opposed to needing to move from side to side, a worker may need continued mobility up and down, such as when climbing up or down a ladder. One of the options here may be the use of a "vertical lifeline" system.

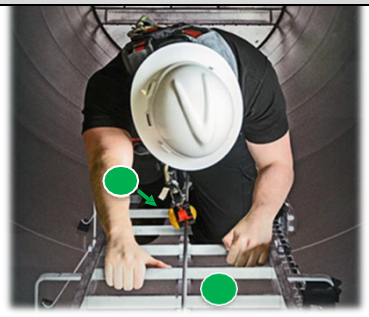
For locations where more permanent protection is needed to a vertical location, such as climbing an access ladder to a warehouse mezzanine, permanent vertical lifelines are becoming more and more the norm.

In the past the most common type of fall protection seen on fixed ladders was the "ladder cage," pictured here. However, as of November 19, 2018, what OSHA permits for fall protection on fixed ladders began to change for ***fixed ladders that extend more than 24 feet (7.3 m)*** above a lower level. For systems installed before this time, ladder cages will be "grandfathered" until 2036. For any built after this time, the required controls are:

- Personal Fall Arrest System (overhead SRL); or
- Ladder Safety System (VLL) – 1910.28(b)(9)(i)(B)

Harness w/ Front D / Ladderlatch
Permanent Vertical Lifeline



Permanent Vertical Lifeline System In-Use	
	1.) Cable Lifeline 2.) Ladderlatch to Harness Front "D-Ring"
	Common Application Areas
	• Building Industrial Ladders (mezzanine, roof); • Utility Transmission Towers • Silos, Smokestacks, other Vertical Structures

2.6 Additional Important Notes on Anchorage Points

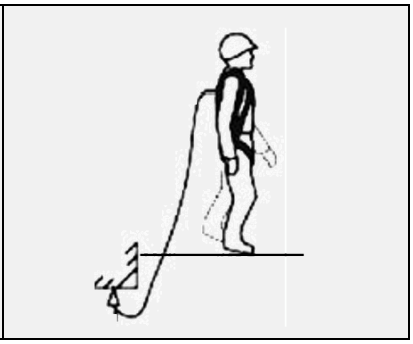
While finding an anchorage of proper strength as well as a means to connect to it are greatly important, there are some additional considerations that must be looked at when selecting an anchorage point.

Anchor Location

Too Much Free Fall –

Although not possible in all situations, finding an anchorage point that is both above and vertically in line with the worker is critically important for most types of connecting devices that may be used. If the anchor is not above the worker, the worker will free fall a distance greater than their system has been designed to be able to withstand. This could be very dangerous for the worker due to high fall forces that cannot be safely dissipated.

- Free fall is the distance that the worker travels before the connecting device of their PFAS starts to catch.
  - The farther one falls before their connectors starts to catch, the greater the amount of force to stop.
  - Too much free fall (from a foot-level tie-off) will overwhelm the braking capacity of most connecting devices.
  - Aim for a tie-off at ***shoulder-level or higher***.

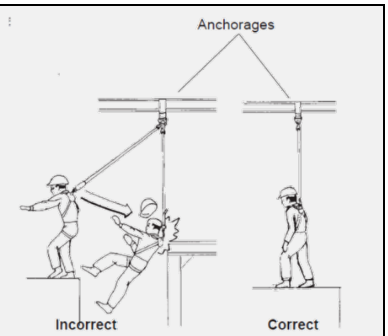


Swing Fall –

Another issue with location is that the anchor needs to be as close to being in-line with the worker as possible. If not, the potential for a "swing fall" will exist. This is a situation where when the worker falls and their lanyard begins to catch, gravity will automatically pull them back towards the point below which they were anchored.

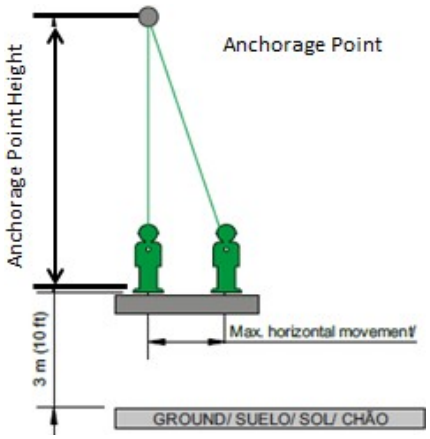
If there are any obstructions in the way, the fall victim may strike them with nearly as much force as hitting the ground. As a result, most manufacturers will put a limitation on how far the worker may work to the side of their anchor.

- Where a worker swings horizontally from their anchorage because of too much movement away from it.
  - A worker can hit an object while swinging with ***as much force*** as hitting the ground in a straight-down fall.
  - Keep anchor ***above*** & vertically ***in line*** with the worker.
  - Avoid walking too far in any direction away from an anchorage point, especially with a large SRL.



Swing fall issues commonly come up when workers are using self-retracting lanyards that allow line to pay out as they walk away from the device. As a general rule, these devices must be used only overhead, and should **NOT** ***be laid at ground level*** so that workers have horizontal mobility. The issue that can arise is that in the case of a fall not only will the unit likely not function correctly, but a massive swing fall will result, and the worker may even strike a lower surface due to inadequate clearance.

Often the question arises as to how far a worker can walk in different directions when hooked up to an overhead SRL. As the charts below show, the distance is proportional to the height of the device anchorage over the worker's head.



Example of Maximum Horizontal Movement Below an Anchorage

Swing Fall Questions for You – Use the chart above.

1) How far may the worker move to the side when the SRL is anchored 12' overhead?_____

2) How much side movement allowed when this changes to 32' overhead?_____

Rescue

The worker must always consider how accessible they will be for rescue if they were to fall and be suspended from the selected anchorage point, as the longer they hang, the more potential there is for "suspension trauma."

- OSHA:
  - "The employer must provide for prompt rescue of each employee in the event of a fall." – 1910.140(c)(21) / 1926.502(d)(20)
- Tritech Fall Protection:
  - As a general guide, Tritech recommends that a company should aim to rescue a fallen worker ***within 15 minutes***.
  - Don't work until a rescue plan has been decided.

Chapter III – Bodywear

3.1 Full Body Harness

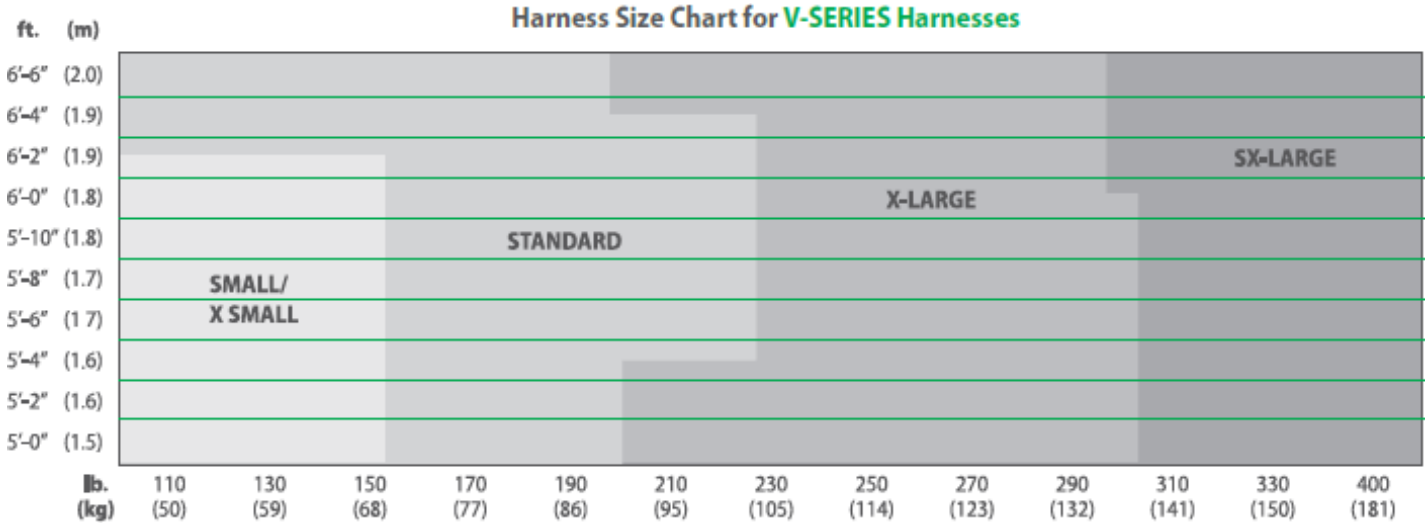
A “full body harness” is a type of personal protective equipment (PPE) worn by the worker to provide support from different “D-Rings” during the activities of fall restraint, positioning, and fall arrest.

Wearing it Correctly

The full body harness (FBH) will only fully protect the worker if it is worn correctly. Workers are often seen wearing harnesses that are way too loose that will become quite dangerous in a fall.

Significant injury can happen when a loose harness rides up on its user in a fall, imparting high forces on parts of the body other than the major muscles and bones of the thighs.

The first step to the entire process of “donning” (putting on) of a harness is realizing that they are not “one size fits all;” there are 4 different sizes. MSA’s sizing chart uses the factors of (1) height and (2) weight of the worker.



3.2 Harness Basics

Full body harnesses replaced body belts as the only approved form of "bodywear" permitted by OSHA for ***use in fall arrest*** situations starting in January of 1998 due to their ability to more safely focus fall forces into the legs and hips, away from the abdominal region.

The full body harness is a much more complex piece of equipment that has many parts and pieces that bear discussion at this point. There are 4 main parts to any harness; they include:

3.2.1 Webbing Parts / Inspection

The webbing consists of the grey and black straps that can be seen on this V-FLEX harness. In some cases, it is covered by padding, as is the case here with the shoulder straps.

- Thigh Straps – These distribute forces to the muscles and bones of the thighs.
- Sub-Pelvic Strap – Many harnesses will have a strap that joins both sets of leg straps on the back side of the harness below the wearer's buttocks. This strap is designed to transmit forces applied during fall arrest and post-fall suspension to the pelvic area.
- Torso & Shoulder Straps – The rest of the straps on the harness are used to encapsulate the top part of the worker's torso. On the front of the harness, adjusters allow harness tightness to loosened or snugged down. Shoulder straps pass by on either side of the neck and will hold the harness on the wearer in a head-first fall.
- Load Indicator – Another webbing feature that will be found on a harness is what is known as the "fall arrest load indicator" (pictured to the left). This is a fold of webbing that has been sewn into place by a single, straight stitch with the purpose to rip free when fall forces are applied.

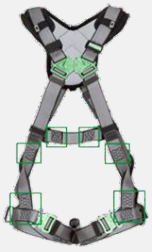
When "deployed" it will expose a tag underneath to tell the inspector to immediately remove the harness from any further service permanently.

Note: This will often be referred to as a "tattletale."

Web Inspection Points	
• Cuts, tears, & frays that weaken the webbing. • Permanent discoloration, which is an indication of chemical or UV radiation deterioration. • Burns or melted spots from "hot work" activities. • Writing on webbing must be done with a "non-toxic" **ASTM D 4236** Marker.	

3.2.2 Stitching / Inspection

Stitching unites different straps of the harness together. Usually it will come in the form of a "box" or a "honeycomb" style, and its purpose is to unite the various of lengths of webbing that come together to form the full body harness.

Stitching Inspection Points	
• There should not be any broken threads in the stitch itself. ○ Note: The end of a stitch, known as its "tail," may look like a broken thread. • Check straps to ensure that they are not pulling apart, even if the stitch is intact. • Ensure that the entire stitch is in-place, not coming undone. The entire "box" or "honeycomb" stitch needs to be in-place and not unraveling.	

3.2.3 Tags / Inspection

The tag is a very important source of information that will tell about many important features of the harness such as when it was manufactured, its capacity as well as size, and what its designated uses are.

Tag Inspection Points	
• Is the tag ***present*** and completely ***legible***? • Harness Capacity – Make sure the user weight with all tools doesn't surpass what is listed. • Service Life – Tritech states that its fall protection equipment does not have a "service life" of a specified number of years (5 was a common number in the past) if it passes regular ***pre-use*** and ***competent person*** inspections.	

3.2.4 Hardware (D-Rings & Buckles) / Inspection

3.2.4.1 D-Rings

One of the most visible types of "hardware" on a harness is the "D-ring."

Harnesses can have a variety of different D-shaped rings that serve a number of purposes. The most important is the fall arrest attachment known as the "dorsal D-ring." This dorsal (back) ring serves as the fall arrest attachment point for the worker's connection device and must be located where the rear shoulder straps cross between the shoulder blades.

The location of the back D-ring is important because it affects one's body orientation after a fall and influences the motion of the body, and distribution of forces upon it, during fall arrest.

- If the back D-ring is positioned between the worker's shoulder blades, they will be suspended at ***an angle less than 30 degrees*** from vertical, a requirement by law.

- If the back D-ring is positioned too ***low on the worker's*** back they will be suspended in a more horizontal position after their fall is arrested, causing significant distress.

Besides the dorsal "D," a harness may have a variety of other rings that serve other purposes. The symbols that follow will be found on any equipment meeting the requirements of the Canadian Standards Association (CSA), a non-governmental, standards development body that oversees equipment design.

CLASS A: FALL ARREST -

A Class A harness is designed to support the body during and after the arrest of a fall. This is the most basic form of full body harness and is denoted by the back or "Dorsal D-Ring."

CLASS D: SUSPENSION & CONTROLLED DESCENT -

Class D harnesses are designed for suspension or controlled descent from heights. In addition to having the Class A connector, they will have one or more rings at waist level used for rappelling type activities.

CLASS E: LIMITED ACCESS –

Class E harnesses are designed to support the user in a position that "reduces the worker's profile" during passage into a confined space. This type of harness must have a connector on each of the shoulder straps. The D-rings on the shoulder straps are connected to a "spreader bar" so that the worker can be lowered into a tight space.

CLASS L: LADDER CLIMBING –

This type of a harness carries a D-ring on its front for attachment to ***permanent*** vertical lifeline systems (ladder safety systems) of the sort discussed in anchorage connectors.

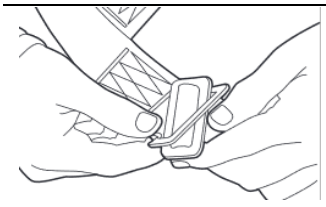
CLASS P: WORK POSITIONING –

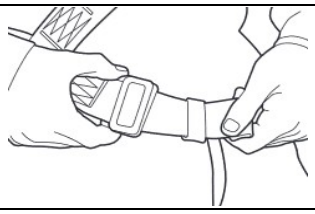
Class P harnesses are used to perform work positioning (one of the three applications of the Personal Fall Protection System). The worker has a D-ring on either side of their harness into which they connect a positioning lanyard which is used to connect out in front of them so that they can work hands-free in a vertical position; the lanyard at their waist becomes the "third point of contact."

3.2.4.2 Buckles

Hardware sometimes is in-place to (1) connect straps together or to (2) make adjustments in harness fit.

Mating Buckles –

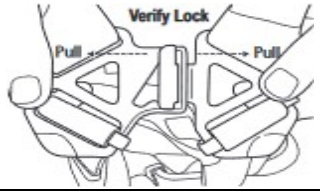




These buckles, called the "Qwik-Fit", are the most basic of those that can be found on a harness. There are a "male" and a "female" side to this connector.

To buckle, slide the male side of the buckle through the slots that can be seen in the right side of the photograph.

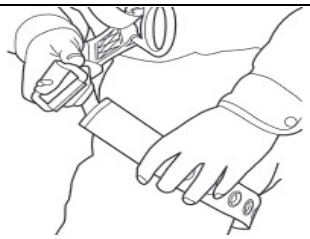
RaceForm Buckle –

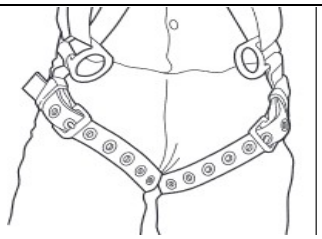


This buckle works on a similar concept to that of the mating buckle above (with a male and a female side).

Here the main difference is that the entire chest strap (a traditional feature on most harnesses) has been eliminated in favor of this buckle, which leads to a much more snug fit.

Tongue Buckle –

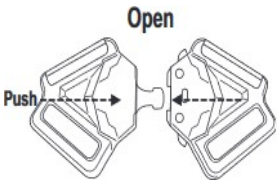


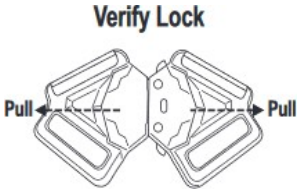


This very popular buckle works much like a belt for each leg on the bottom of the harness.

One end of the strap has a buckle with a roller and a "tongue" and the other strap that connects into it has various holes along its length known as "grommets" through which the tongue is passed to hold the strap.

Quick Connect –





The quick connect, with this version being known as "RaceFlex", locks like a car seatbelt. The user simply slides the two ends together until they click into place.

To unlock, the wearer must press on two ears on either side of the female buckle at the same time, pulling apart.

Hardware Inspection Points	
• Any cracks, bends, or breaks in the metal itself. • Corrosion, which can show up as red rust or flaking of metal off the hardware, or pitting (which shows up as small holes down in the metal). • Sharp edges where the metal has been worn down below its initial thickness or diameter. • Check the webbing ***below hardware***, where possible, for damage or staining.	

3.3 Specialty Harnesses

- **Meant for tower climbers.**
- **Incorporate a seat for suspended positioning**

V-FIT Tower Harness w/ Seat

- **Designed for situations of potential arc flash.**
- **40 cal / cm2 rating**

EVOTECH Arc-Rated Harness

- Kevlar webbing
- Hot work activities, harsh work conditions that could cut a normal harness

Gravity® Welder

- Easy-to-clean coating on web
- Built for dirty environments or where clean PPE is critical

Gravity® Urethane-Coated

- Wide assortment of D-rings for varied activities
- Designed to be a rescuer's harness

Gravity® Suspension

This final specialty harness takes care of a need on *many* workers' minds: that of self-rescue. The "PRD," as it is known, comes with spool of thin rope up to 65' in length that sits compactly on the worker's back in a pouch. During a fall, it will bring the worker to a stop. The worker can then pull a cord that initiates play-out of the line, beginning a controlled descent to the ground.

An important additional feature is a rescue pole that can be purchased separately to activate the descent feature of an unconscious worker who has fallen and who is completely unable to further help themselves; with the pole, a rescuer can activate their system.

Personal Rescue Device (PRD)

3.4 Harness Donning

Step 1

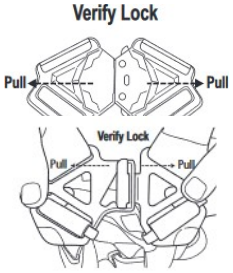
After having loosened the straps through the adjustment, undo all buckles and shake the harness while lifting it by the back D-ring. Straighten any twisted webbing.

With the sub-pelvic strap behind you, hang the harness on your shoulders, letting it drape down. Ensure that the sub-pelvic strap is properly located. Fall arrest systems must transmit force primarily to the pelvic and upper thigh regions of the skeletal system. These are the strongest parts of the body, and they the best located for distributing force away from the vulnerable organs of the midsection and the spinal column. Center the back D-ring between the shoulder blades, adjusting as necessary to ensure proper placement.

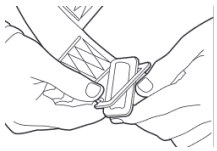
Step 2

Begin by fastening the chest strap. As mentioned previously, this strap holds the shoulder straps in-place and must remain tight enough to retain the harness over the shoulders in a fall.

For the quick-connect buckle, push together, ensuring that both sides are fully connected and both locking pawls ("ears") are engaged. Pull on the shoulder straps to verify sides are locked.

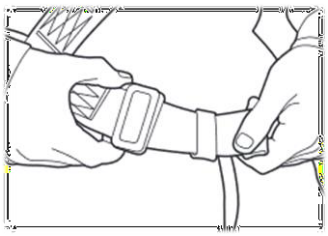


For Qwik-Fit™ or RaceForm buckles, connect the male and female sides of the buckle.

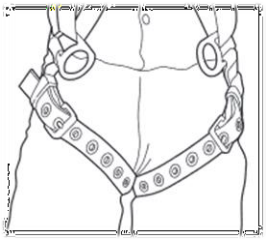


Step 3

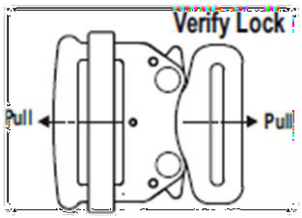
Leg strap connectors could be any of the following styles. Regardless of type, pull one strap at a time between your legs, ensuring that it is not twisted before connecting.



Mating Buckle



Tongue & Grommet



Quick Connect

Step 4

Adjust the torso / shoulder straps for a snug, comfortable fit by pulling down on the torso webbing ends, as is being demonstrated in the picture to the left. By pulling down on the webbing through the friction buckles, not only will the shoulder straps be pulled tight to the shoulders, but the leg straps will also tighten down on the thighs.

This is a good time to walk around a bit in the harness to check for comfort and to ensure that the leg straps do not move up and down with movement. It is key that fall forces are properly imparted on the parts of the body able to take them in a fall:

1. the shoulders in a head-first fall &
2. the thighs in a feet-first fall. Use the web keepers to stow any excess webbing.

3.5 Harness Cleaning

Clean the equipment with a solution of water and mild laundry detergent. Dry hardware with a clean cloth and hang to air dry. Do not speed dry with heat. Excessive accumulation of dirt, paint, or other foreign matter may prevent proper function and, in severe cases, weaken the webbing. To clean Secure-Fit Buckles and Quick Connect Buckles remove foreign material with a cotton swab. In dusty environments, fine particles can prevent proper function of the buckle. Dip the buckle in clean water to flush fine particles. Remove excess water and allow to air dry. Questions concerning conditions and cleaning should be directed to Tritech Fall Protection.

3.6 Storage

Store the equipment in a cool, dry, and clean place out of direct sunlight. Avoid areas where heat, moisture, light, oil, and chemicals or their vapors or other degrading elements may be present. Equipment which is damaged or in need of maintenance should not be stored in the same area as equipment designated as unusable. Heavily soiled, wet, or otherwise contaminated equipment should be properly maintained (i.e., cleaned & dried) prior to storage. Prior to using equipment which has been stored for long periods of time, a formal inspection should be performed by a competent person. Store harnesses with the buckles connected.

3.7 Caution

Caution - 1

If any of the previously stated conditions (from the Inspection section) exist, your harness may not be safe.

DO NOT WEAR IT!
ANY HARNESS SUBJECTED TO ARRESTING A FALL MUST BE REMOVED FROM SERVICE.

Caution - 2

Do not use solvent base solutions to clean or identify your harness.

Caution - 3

It is always good practice to store your harness away by hanging it up by the dorsal D-Ring.

Chapter IV – Connecting Devices

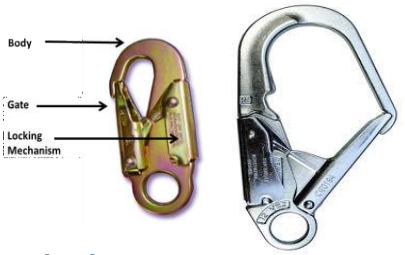
4.1 Fixed Length Energy-Absorbing Lanyards

An energy-absorbing lanyard is a flexible line of rope, wire cable, or webbing which has a connector at each end for uniting the full body harness to the anchorage connector on the anchorage point. Utilizing the synthetic web-style lanyard shown below the main components of an energy-absorbing lanyard can be discussed.

4.1.1 Snaphooks & Carabiners

Snaphooks / Carabiners

The "snaphook" is a type of hardware specific to connection devices. In most cases it is "integrally" connected to the lanyard, meaning that it is not removable. The snaphooks shown on the lanyard are the most common type that can be found, although a larger version of them known as the "rebar" or "pelican" hook is also available, as shown to the right.



Standard Snap/Rebar Snaphook

A carabiner is an alternative to a snaphook that will be found on SRLs. Although they have a slightly different shape and locking mechanism, the rules for them are the same.

Note: While snaphooks have been "locking" for more than 20 years, "twist lock" carabiners where the gate must be rotated various times to lock or unlock are still readily common. For fall protection purposes, ***only auto locking snaphooks and carabiners are permitted***.

Carabiner

The main difference between large and small snaphooks or carabiners is that with the larger opening it is possible to go around larger objects. Regardless of size, there are some rules surrounding snaphooks that always apply:

- Compatibility – The hook must be enough smaller than the hardware into which it is being connected so as not to permit force to be placed onto the gate in any possible orientation in a fall.

  The picture to the right shows a compatible connection because when hanging on this "D-ring" in an abnormal configuration the gate of the hook is not being touched.

- Gate Strength – In the case where a mistake is made and the gate does accidentally come into contact with something that can push on it, it must be strong enough that it cannot be forced open.

  To address this issue special snaphooks, known as ANSI (American National Standards Institute) snaps, are built with a gate that can withstand 3,600 pounds when pushed from the front or side and the gate is completely closed. This special snaphook is now the OSHA requirement and must be on all equipment regardless of when it was purchased. ANSI gates will be marked.

4.1.2 Lanyard Material (Web, Cable, Stretchable Web)

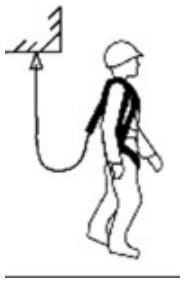
The second main component is the material that forms the lines between the two end snaphooks.

	***Web Lanyard*** • 1"-wide nylon or polyester webbing, fixed or adjustable lengths
	***Synthetic Webbing*** • Recommended for more rugged environments where abrasions, cuts, and exposure to chemicals is possible
	***Stretch Web Lanyard*** • This is still web-based lanyard, but the elasticity keeps the lanyard as short as possible when not in-use.

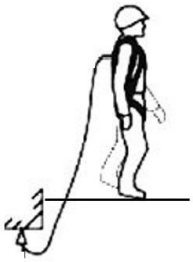
The most common length from snaphook end to snaphook end generally ***is 6 feet***.

4.1.3 Energy-Absorber

The first major question when selecting a lanyard is how much "free fall" will be possible in the work situation Quite often the worker must attach to anchor points that are below their back D-ring, such as at waist level or near their feet. And while this may not present an obvious problem, the issue is actually a very serious one. Consider the following pictures:



- Worker is attached ***above*** his dorsal D-ring.
- He will travel no more than 6' before his lanyard begins to "catch."



- Worker is attached ***below*** his dorsal D-ring.
- He will travel ***up to 12'*** before his lanyard begins to "catch."

Attaching a standard lanyard too low will result in more free fall than this style was designed to handle, possibly leading to ***maximum arrest forces upwards of 3,000 pounds***. A lanyard with a sufficient "energy-absorber" needs to be selected.

Pack Energy Absorber

The energy-absorber is the part on the lanyard whose job it is to decelerate the fall victim following the build-up of fall forces during the "free fall" period so that they are not otherwise transmitted to the worker's body in one sudden jolt. For this reason, any lanyard being used for fall arrest must have an energy absorber. The energy-absorber ensures a "maximum arrest force."

(MAF) of 1,800 pounds when a lanyard is used as designed.

4.1.4 Free Fall Definition

Free Fall – Before the Absorber Functions

- The beginning part of a fall, starting from the time the worker leaves the surface where they were standing, and gravity starts to pull them downward. Free fall ends as soon as the worker's lanyard straightens and starts to catch them.

4.1.5 Deceleration Definition

Deceleration – When the Absorber Starts to Function

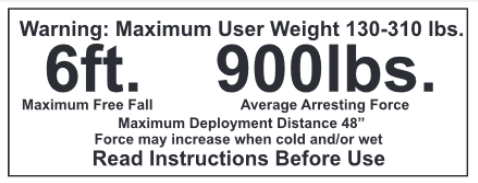
- Once the lanyard begins to "catch" the worker, this has begun. At this point the "energy-absorber" will start to tear open to brake the fall to a smooth stop.

4.1.6 White & Black Label Lanyards

ANSI has chosen to deal with this issue of free fall with two styles of lanyards:

- White Label Lanyards; &
- Black Label Lanyards

Depending on possible anchorage locations for workers, one style or the other must be chosen.

Lanyard Energy-Absorber Styles – (ANSI) Z359.13 – 2013)		
White Label 	• Most commonly used. • Only designed for anchorage points that are at the level of the work's back D-ring or higher	Specifications: • Maximum Free Fall: **6 Feet** • Max. Deceleration Distance: **4 Feet (48")**
Black Label 	• Built with a larger energy- absorber. • Appropriate for anchorage points that are high or low	Specifications: • Max. Free Fall: **12 Feet** • Max. Deceleration Distance: **5 Feet (60")**

Note 1:
The user capacity for equipment meeting ANSI standards falls within a range from ***130 to 310 pounds***. Individuals who are lighter than the minimum or heavier than the maximum capacity are not compliant with the standard.

4.1.7 Specialty Lanyards

Twin-Leg Lanyards / 100% Connection

For those who need to work at heights and who will be able to maintain a stationary position, a single-leg lanyard may be appropriate. However, for many there will be the necessity to move around. As mentioned earlier in this manual, OSHA doesn't permit the worker to be disconnected for any length of time once having gone over the height activation points of their particular industry if no other form of fall protection is in-place. The twin-leg lanyard is a very important tool for this.

Twin- Leg

This lanyard type has two legs on one end that connect into a single energy-absorber and a single snaphook at the end that connects into the back of the user's harness.

- Twin-leg lanyards allow the worker the ability to practice the concept of "***100% connection***. At least one leg of the lanyard is connected at all times.

Climbing with 100% Connection

4.1.8 Inspection & Maintenance

This is an OSHA and manufacturer rule that applies each time that this, or any other part of the PFAS, is utilized during a work activity.

"Personal fall arrest systems shall be inspected prior to each use for [mildew], wear, damage and other deterioration, and defective ***components shall be removed from service."***

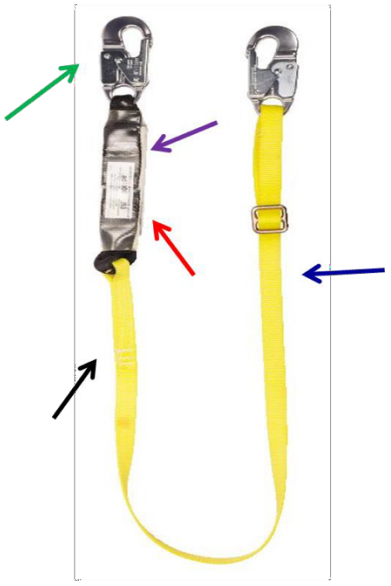
1910.140(c)(18) & **1926.502(d)(21)**,

Energy-Absorbing Lanyards

Inspection points on lanyards will be very similar to those mentioned previously with harnesses, except where components are different, as the case with snaphooks / carabiners, and the energy absorber.

Hardware:

- Oxidation – Free of Pitting & Corrosion
- Functionality – Auto-Closing & Auto-Locking
  - Whether corroded, broken, or they have been tampered with, when opened the gate must close on its own and become locked; if it does not, it must fail.
- No missing / broken pars, such as internal springs or external rivets



Energy Absorber:

- Inspect the outer cover:
  - Undeployed, Free of Holes or other Damage
  - Tags – Completely Legible

Stitching:

- Stitch points here must pass the same criteria that they did on the harness.

No Broken Threads — Entire Stitch Intact
No Stitch Unraveling — Stitched Material Not Separating

Connector Body:

No Cuts, Tears, or Frays — No Burns or Holes
No Permanent Discoloration — No Corrosion, Breaks or Bends on Wire Cable

4.2 Self-Retracting Lifelines

A "self-retracting lanyard" (SRL) is a device that contains a variable amount of drum-wound line (steel cable, synthetic webbing, or synthetic rope) that may be slowly extracted from or retracted back onto the drum under slight tension during normal movement. The snaphook at the line end is to be attached to the fall arrest D-ring on the body harness. When a fall occurs, brakes activate inside the drum, stopping the worker in a matter of inches.

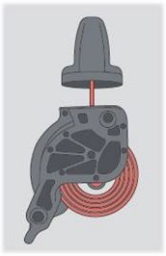
SRL

SRL Insides

- These work on the same principles as a seatbelt in a car. Under normal conditions, the line is extracted or retracted with no locking occurring
- If the unit detects a quick extraction of line, pieces inside the unit known as "pawls" flip out to lock into a ratchet wheel bolted to the drum, stopping its rotation until a brake begins to function.

Brakes on these devices operate in a variety of different ways:

- Brake Pad – Similar to what is found in a car.
- Energy-Absorbing Coil – A coil found inside the unit straightens out in the case of the fall.
- Tear Tape Pack – A pack of the same sort found on lanyards rips open in the fall.



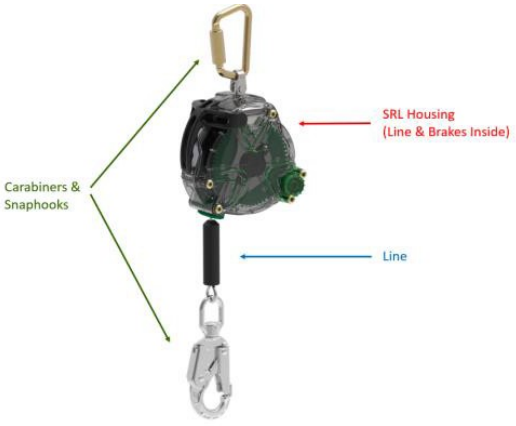
EA Coil

Energy-absorption is available throughout the entire *working range* of the lifeline, meaning that the brake will work whether the worker falls with 6 inches of line extracted or the entire amount contained in the unit is paid-out. The energy-absorption mechanisms in the SRL limit fall forces under 1,800 pounds.

SRLs are very similar to energy-absorbing lanyards in their components. Like EALs, they have:

1. Means of connection.
2. An energy absorber.
3. A length of line.

The main differences from lanyards lie in the ***amount of line*** contained in one of these units and ***the way the brakes work***. Otherwise, one end of the device goes to the back D-ring of the worker's harness and the other end gets attached to the anchorage point, just like was seen with energy-absorbing lanyards.



SRL Parts

4.2.1 SRLs vs. PFLs

Originally all self-retracting lanyards were very large and designed for the housing with all of its line to be hung above the worker; now SRLs come in two types:

1. Traditional SRL – Housing is hung overhead, with the line being pulled down to connect to the worker; and

2. Personal Fall Limiter (PFL) – Small housing worn by the user (like with a lanyard), carried from job to job.

Web SRL

Housing Hangs from ***Anchor***

Mini PFL

Housing Hangs from ***Worker's Back***

Small "personal fall limiters" (PFLs) have come about as a viable alternative to an energy-absorbing lanyard since they can be worn by the worker as they move around the jobsite, and they have the added benefit of expanding and contracting, depending on the length of line needed by the job.

- Often bring the worker to a ***stop in a matter of inches*** because of their quick locking action.

Larger SRLs are useful because they can come in lengths of well over 100 feet.

- May be used as fall protection for long vertical climbs when housing is attached at the top of the ladder.

4.2.2 Class A & Class B SRLs

Just as ANSI created updates for lanyards in recent years to reflect updates in technologies / increases in fall protection knowledge, it did so more recently with SRLs as well. Under the new system it listed two main styles of SRL and PFL, based on their "maximum arrest distance."

SRL & PFL Classes – ANSI Z359.14-2014

Maximum Arrest Distance (MAD) – The total stopping distance of an SRL once a fall starts. It includes:

- The amount of line that pulls out before the device locks off – "Activation Distance".
- The amount of line that pulls out after the brakes engage – "Deceleration Distance".

We do not know the "Activation Distance" or the "Deceleration Distance" on their own; it is always given just as the "MAD".

Class A SRL / PFL – Maximum Arrest Distance – 2 Feet (24")

Class B SRL / PFL – Maximum Arrest Distance – 4 ½ Feet (54")

4.2.3 Specialty SRLs & PFLs

4.2.3.1 Twin-Leg & Tie-Back PFLs

V-Tec PFL

V-Shock PFL

Workman Twin Tie-Back PFL

Just as there were twin-leg energy-absorbing lanyards, this is also an option with self-retracting lifelines. Specifically, the devices above allow the worker to practice 100% connection while in movement from one location to another. Here, there are some major advantages over the more traditional twin-leg lanyard:

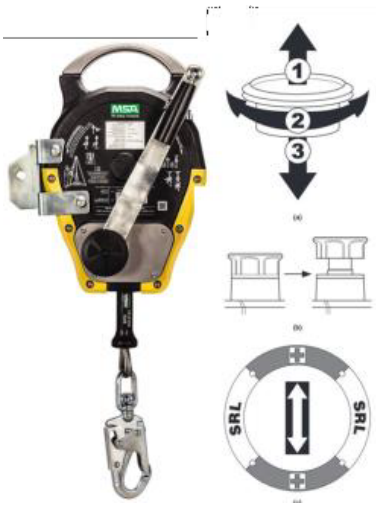
PFL Twin-Leg Benefits over Lanyards

- **Size** – The devices are compact when not in-use, eliminating trip hazards.
- **Free Fall is Decreased** – Only the amount of line needed is extracted, meaning free fall is reduced.
- **Total Fall Distance is Decreased** – Because it is so fast-acting, these stop the worker faster than a lanyard can.

4.2.3.2 Self-Retracting Lifeline with Rescue (SRL-R)

Another type of retractable offers a feature unlike anything seen up to this point. Known as the Workman® Rescuer, it functions as an SRL in normal use but can be converted into a rescue tool if the worker falls into it. Although useful in a wide variety of different applications, it is commonly utilized by teams that are making entries into confined spaces where there is both a fall hazard and / or the potential for the worker to be overcome by an atmospheric hazard and need to be pulled out. This model incorporates a crank mechanism that may be activated to rescue (raise or lower) an attached person in an emergency.

Traditionally such units have been attached to what is known as a tripod. However, newer technologies allow it to be attached to other types of confined space "davits" or, if so desired, simply hung like any other SRL over a work area where a fall hazard exists, and extrication / rescue may become necessary.



Workman® Rescuer

4.2.3.3 Sealed SRLs

Sealed units such as the one shown to the right find work in environments that are very harsh such as in the Oil & Gas industry as well as in the salty ocean environment of offshore wind turbines. The important aspect with these units is that critical internal components that could be damaged by the harsh environments are completely sealed and kept away from them. This contrasts with traditional SRL's where dirt, gunk, and salt spray can be retracted with the lifeline up into the unit where it all can affect critical components such as the line retention spring or the entire internal braking mechanism.

Sealed SRL

4.2.3.4 Leading Edge SRLs / PFLs (SRL-LE)

A "leading edge" SRL is one that has been designed to be able to withstand the forces of having its line bent over an edge when a worker falls. The reason that special designing needs to take place is because many SRLs store their energy-absorber capabilities in the housing.

What typically happens is that when the worker falls, their line (no matter the composition) bites into the edge:

- eliminating the ability of the energy-absorber to function; and
- severely stressing the line in the area of the bend.

While normal SRLs are not designed for this type of use, Leading Edge SRLs (SRL-LE) are designed specially to deal with this type of a fall.

1. **Line Protection** – A special protective cover is placed over the line and / or a larger, stronger line material is used.
2. **Added Energy-Absorber** – An additional energy absorber is put at the end of the line where the worker attaches into their harness. If the line bites in as described, this extra absorber begins to open to minimize force and protect the line.

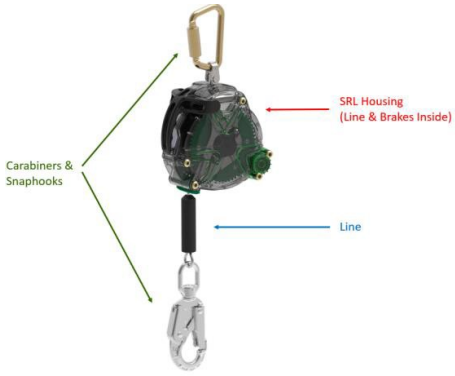
These devices, because of the rigorous tests that they must pass, are specialized to tackle especially harsh situations where free fall is high due to low tie-off and where coming into contact with a sharp edge is likely. As with the other styles already covered, these also come in both SRL and smaller PFL versions.

20' Leading Edge SRL

8' Twin-Leg Leading Edge PFL

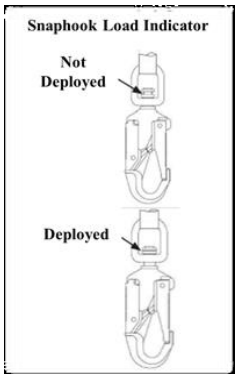
4.2.4 Inspection & Maintenance

Inspecting an SRL will be straightforward already knowing the basic parameters that have been set forth for other pieces of equipment. However, due to some obvious differences, a few points need to be highlighted here while others are reviewed.

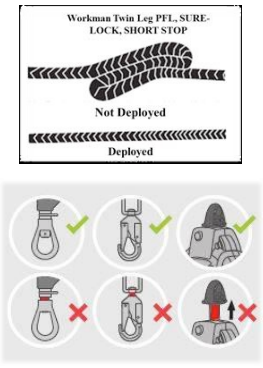


Hardware:

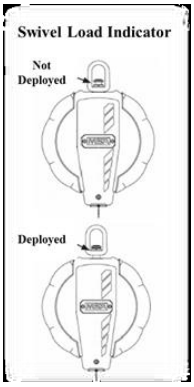
- Snaphooks / Carabiners – Corrosion-Free, Auto-Closing & Locking
- Top Swivel – No Cracks / Breaks, Swivels Correctly, All Rivets Tight
- Load Indicator – Verify not Deployed



Deployed Snaphook Load Indicator



Web & Latchways Load Indicators



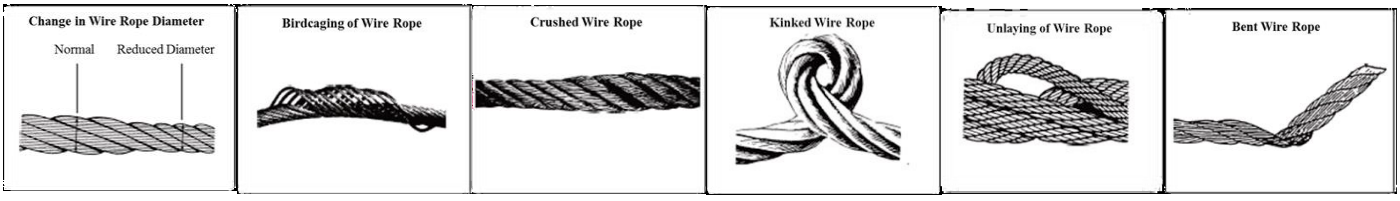
Deployed Swivel Load Indicator

Housing:

- Free of Cracks, Breaks, and Dents that Affect Operation (Spinning of the Internal Drum)
- Label – Present & Completely Legible

Lifeline:

For synthetic webbing or rope, inspect the entire length for any amount of damage anywhere along the line. For cable, wearing gloves and using a cloth, allow the line to retract in after having pulled it all out, checking for corrosion or breaks.



Make sure that the connection on the end of the line—be it a stitch with synthetic materials or a “swage” that holds the cable in a teardrop shape to form an eye—be unbroken and not loose.

Chapter V – Manufacturer Required Annual Inspection / Recertification

Fall protection systems are required to be inspected by the authorized person prior to each use, and by a qualified person or competent person at least annually, in accordance with ANSI/ASSE Z359 and OSHA 1910. This period should be more frequent in areas of extreme conditions.

In Canada, recertification by an authorized integrator is required no less than annually. In the United States, recertification is not to exceed 5 years. In between the 5 years, a competent person must inspect and document the systems at least annually, and all problems should be brought to the attention of Tritech for immediate action to maintain compliance with OSHA and ANSI standards.

During the inspection, Tritech technicians look at the lifeline system from end to end to identify any wearing on components as well ensuring that the system is tensioned appropriately. The travelling devices are cleaned and inspected for wear or faulty parts to ensure smooth operation for the user while moving along the system. Tritech also thoroughly inspects the structural steel components of the system for cracks, corrosion, and any other deficiencies. Foundations are the pillar that hold everything up, so Tritech makes certain that the foundations are in good condition to support the steel structures that our systems attach to. Any cracks, crumbling, leaning, impact damage or major corrosion would need to be addressed immediately for remediation.

Chapter VI – What to Do Should a Fall Occur

Should a fall occur on your fall protection system, rescue the user according to your company's fall rescue plan. Once the user has been rescued and removed from the system, the self-retracting lanyard/connecting device and the user's harness should be removed from service and discarded.

Immediately tag the system out of service to prevent other users from accessing it. This includes removing any addition connecting devices that may still be attached to the system. Document the area of impact with pictures of the surrounding components to pass on for further evaluation. Contact Tritech Fall Protection to schedule a technician to come perform a full visual inspection of the system to determine if any damage has been caused to the components.

Chapter VII – System Damage by Other Means

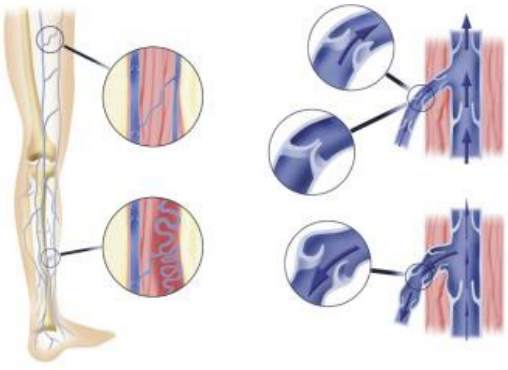
Damage to fall protection systems can happen in many ways. Outside of normal wear and tear the most common causes of damage and repairs are:

- Users attaching the connecting device to mobile equipment such as trains, trucks, and heavy equipment. A pull on the system by one of these means will surely result in broken lanyards and travelling devices, as well as overextending the forces allowed on the anchor points.

- Other moveable devices, cranes, jibbooms etc. coming into contact with the fall protection system. This can cause deformation of critical components that allow the system to operate continuously and smoothly.

- Hazardous environments. Areas such as fertilizer and chemical storage facilities can prematurely wear the components of the fall protection system. This is why regular and annual inspections are so important to prevent a small issue from becoming a larger problem where the safety of the users comes into questions.

Chapter VIII – Rescue



A personal fall arrest system does no good to save a worker's life if they cannot be reached for proper rescue after their fall. In fact, there are some real dangers for the victim if rescuers cannot get to them in time or where they didn't even know that the worker had fallen in the first place.

Rescue is something that often doesn't get the attention that it deserves until it is time to carry out a rescue in real life. Once the victim has fallen and is waiting to be retrieved is the wrong time to make decisions about how to safely get them down. The unplanned rescue may be quite simple and go off without a hitch. However, sometimes rescuers become victims themselves while working in haste to try to quickly get down a fellow employee in-need, forgetting about their own safety.

The goal of this module is first to bring light to the issue of why a rescue plan must be in-place ***before the worker ever climbs*** above the ground in the first place. This section will then get into such things as the legal requirements for rescue, its different types, the equipment that is available for use in different scenarios, and the overall process that needs to be followed in any situation where another human is going to put themself in harm's way to climb to heights in aid of another.

8.1 Suspension Trauma

It's a normal day out on the jobsite and a worker has taken the time to prep for his job, including inspecting all his personal fall arrest equipment and scoping out a solid anchorage point that he can safely reach while maintaining 100 percent connection. He completes his pre-task prep work and climbs into position where he begins his task. As his time at the workstation continues, he becomes more comfortable and begins to let his guard down just a bit as he moves around his work position. Then, something happens. It may be that he simply loses his balance, he may drop a tool and try to catch it, or he may slip. He enters the first stage of the fall known as "free fall" and transitions into a safe deceleration as his energy absorber activates to bring him to a cushioned stop.

As he assesses his situation, now hanging several feet below the work surface on which he once stood, he takes stock.

- Thankfully he didn't hit anything on the way down.
- Also, his harness was fitted properly, so he is oriented in a vertical position and all the straps seem to have done their job.

He's fine overall and glad that he tied-off as he had been told to do so many times over, but it dawns on him that he really isn't sure how he's going to get down.

He was performing a maintenance task in a remote section of the building and although others knew that he was working there, they aren't immediately nearby. After about 5 minutes someone finally comes close enough to his work position to hear his yells and they indicate that they will go get help along with some equipment to try to get him down. At this point, he notes that he is decidedly more uncomfortable than he was when he first fell. The straps are starting to hurt as they dig into his legs, and he doesn't feel quite as strong as he did at first. Is he in any danger as he waits?

The reality is that there is a real danger as he continues to hang in a vertical position. Since his fall, he has not been putting any pressure on his legs, which normally help pump blood back to his heart due to the intertwining of blood vessels with muscles. When the muscles move and flex, this helps squeeze on the blood vessels, pushing the blood back up to the heart. However, as the worker hangs in suspension, the muscles slacken and the decreased pressure on the veins can cause what is known as "***venous pooling***," where blood starts to settle in the legs.

As less and less blood gets back to the heart due to its pooling in the legs, it will also mean that ***less blood will be making its way to the brain*** where it is vitally needed to carry oxygen necessary for normal functioning.

- The body will recognize this decrease in blood flow and will respond by trying to make the heart pump faster to compensate.
- The worker's pulse will go up as the body tries to stave off the effects of oxygen starvation to the brain, but it will fail to work.
- The fallen worker will faint. This usually causes them to fall over, returning the flow of blood. In fall arrest, however, this cannot happen.

From this comes the name "suspension trauma." The body is put in a state of trauma from which it is incapable of responding. Once the pulse decreases, flow further diminishes to the brain and the victim eventually passes out due to a lack of oxygen, with their head slumping forward. At this point the airway can become blocked with little to no oxygen is getting to the brain.

It is hard to say how long this will take to occur. There is still more to learn about this issue. That said, factors such as physical fitness of the victim, age, and overall wellbeing will influence how long they can hold out before problems begin. Depending on the study, onset may begin in as little as 5 minutes, after 30 minutes, or as much as an hour into suspension.

Suspension trauma is something that ***will*** occur if the victim is left hanging for long enough. The employer must plan to get the worker down as fast as possible so as not to roll the dice and discover that a particular victim could not take the strain for an extended period. The rest of this section will be dedicated to discussing how the employer can do this.

8.2 Rescue Considerations

It helps to begin by briefly discussing what the legal requirements for it are. And in the case of OSHA, it can be said that the requirements are broad in scope and few in words. The actual regulation reads as follows:

"The employer shall provide for ***prompt rescue of employees*** in the event of a fall [or shall assure that employees are able to rescue themselves]." – 1910.140(c)(21) / 1926.502(d)(20)

OSHA's word is "prompt," and they leave it ill-defined. All circumstances will be different, requiring different periods of time to effectuate a rescue. Even when asked through letter of interpretation to pin down a time period, they have declined to do so.

An interpretation that can be made of this is the following. The worker needs to be brought down as quickly as possible after the fall and in as close of a state as possible to what they were in when they first fell.

- Worker hangs for 30 minutes but ***is fine*** – OSHA may not cite if it considers this to be a reasonable time.
- Worker hangs for 30 minutes and ***suffers blood, clotting, fainting, and / or death*** – A citation is likely.

It is best simply to know that one is covered in all fall scenarios before ever starting work to avoid the problem of not being able to quickly get a person down and the possible resultant injuries. So, how is this done?

Job Planning

Prior to ever starting a job, many companies will have workers fill out what has become known as a "pre-task plan for safety." This basically outlines information such as:

- What the job is for the day?
- The ***steps*** to the job and the ***hazards*** associated with each.
- Methods of control (elimination, administration, PPE) to be utilized to deal with the hazards.

Like a pilot's checklist, the goal is to simply make sure that ***the worker thinks through*** the task before ever beginning so as not to forget something obvious.

8.3 Rescue Types

One of the things that should be on any pre-task plan for safety when it comes to fall protection is a section that addresses how the rescue will be carried out if it is needed. This is where the worker and their co-workers analyze the situation to visualize what a possible rescue from the work location would look like. The four types of rescues are:

(1) Self-Rescue –

In self-rescue the fall victim is able to move, unassisted, to a safe place after a fall. An example of it would be one in which a worker is at heights, connected to a fall arrest system on a vertical lifeline and proceeds to fall. They are then able to carry out "self-rescue" by regrasping the ladder rungs / pegs and proceeding to the ground.

This also may be more common when using a PFL, due to its quick stopping distance.

(2) Assisted Self-Rescue

Assisted rescue is one where the worker is in a situation that does not permit them to rescue themselves but with minimal help they can be brought to a safe location. As an example, the worker has fallen, and rescuers are able to drop a line to them. They are able to connect themselves to the rescue line and be raised or lowered to a safe location.

After self-rescue, assisted self-rescue is the **next step down in preferred methods in the hierarchy** of rescue techniques because it may involve some exposure of rescuers to a fall risk themselves (still protected via PFAS) and could possibly take some time to set up.

---------- ***Rescue Utility System (RUS)*** ----------

This device, which is a 4:1 mechanical advantage rescue system with anti-reversing pulleys, can be operated remotely from above the victim utilizing a remote rescue pole that comes as part of the kit simply to realize a connection to the victim, at which point the 4:1 system is used.

The top carabiner of the system is connected to an anchorage above the victim. The lower pulley just to the right of the black bag is lowered to the victim who, if conscious, can connect to a D- ring on their harness.

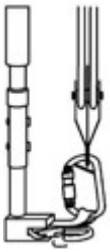
At this point, the rescuer utilizes the green-handled device in the right of the picture to raise the victim slightly so as to be able to put slack in their fall arrest system, disconnecting them if necessary depending on the situation, the rescuer can either raise or lower the victim to a safe position utilizing the green-gripped control handle and the 4:1 "mechanical advantage of the system."

- **"4:1 Mechanical Advantage"** - The rescuer only feels ¼ the weight of the victim.

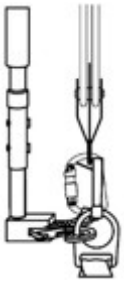
If, on the other hand, they desire to lower the victim, they may push a button on the handle that allows rope to slide through the device to lower the victim in a controlled fashion.

The rescue pole that comes with the device can be used to rescue an unconscious victim. It is simply used as a means of connecting the bottom haul carabiner of the device to the victim.

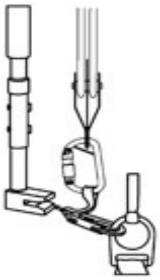
RUS Remote Pole Steps



Attach loop of special carabiner to RUS haul carabiner and it to pole.



Reach to fall victim with pole, connecting special carabiner to their D-ring.



Detach pole from special carabiner.

Lift or lower as normal at this point.

(3) Mechanically Aided Rescue

This type of rescue typically involves the use of an aerial lift to reach a victim who has fallen or who needs medical assistance or is unable to climb down from a work area. The rescuers maneuver the lift below the fallen worker and elevate its basket until reaching the fallen worker, transferring them in.

This type of rescue is second from the bottom in terms of preference when it comes to performing a rescue. Although generally considered to be a relatively safe means of rescue, complications can result if a lift is unavailable or if it is unable to reach the location of the fallen worker. Nevertheless, in many situations, mechanically aided rescue is a very viable method that can be done quickly, safely, and effectively.

(4) Pick-Off Rescue

This is a type of rescue where the rescuer must go to the victim to "pick them off" the structure from which they hang. This involves the active intervention of a rescuer and / or a rescuer team to help a potentially incapacitated or unconscious worker who is unable to help or communicate.

This is the least desirable method in the hierarchy of rescue techniques for a variety of reasons:

- It incorporates rescue devices with a much higher level of training needed to acquire proficiency / competency; and
- It involves the rescuer going out into harm's way to reach the victim and get them down.

The way it works is that the rescuer utilizes some kind of union of components to descend a rope to make a connection to the victim. From there, the rescuer descends with the victim attached to their system until both make it to the ground.

- This type of rescue is ***more complex*** and ***requires additional theory-based and hands-on training*** with the equipment selected before it can become a viable option.

A ***manually operated descent device*** may also be used. When used to rescue an incapacitated person, the device may be rigged to permit lowering by a rescuer stationed aloft or by a rescuer descending to the injured person.

- The Anthron Descender shown to the right can be utilized for the self-evacuation of an injured employee from heights.
- The black Anthron Plus (not pictured here) is specially designed for the type of pick-off rescue described above where the rescuer can descend to the victim, attach, free them from their fall arrest connection and rappel with them to the ground.

8.4 Rescue Performance

In both training exercises and in the event of an actual rescue, there are certain rescue protocols common among professional rescue teams that must be considered and evaluated to assure the smoothest operation of the rescue plan just discussed.

Team Safety

Rescuers should never rush in, even when well trained. There is always a need to plan for how a rescue can be carried out in such a fashion that the safety of the victim is protected while not forgetting about the safety of those who are getting them down. Often, rescuers are taught to ***protect yourself first***, ***protect your team second***, and ***protect your victim third*** simply to not forget about doing the rescue the right way. It is crucial that no one tries to "be a hero" and sidestep the thought-out and established best practice protocols for rescue. When a team assembles, they will ask questions like:

- Is the scene safe?
- What happened?
- In what physical state is the victim?
- What is the identified plan of rescue for the location / job?
- What are the risks involved for the rescuers under the selected plan and how will they be ***eliminated*** or ***controlled***?

Rescuers realize that they sometimes must put themselves in a risky situation to save a life, but in a well-planned rescue procedure all major risks must be eliminated before work ever commences. They must not put themselves in a position where they themselves may require rescue or where they could die while attempting to get someone down.

Keep it Simple

Rescue operations often may be conducted in a variety of ways. The typical "Hollywood-style" rappel rescue, while exciting and adrenaline inducing, can be dangerous and is often not necessary. Rescue personnel can easily sustain many injuries during rescue operations. In the thick of the rescue, potential rescuers have been found to panic and forget important aspects of their training. Pressure can be a great motivator for some but can cause others to fall apart. As a result, the rescue should be as simple and as safe as possible, putting the fewest workers at risk. If a fallen worker can be accessed using a scissor lift, bucket truck, or extension ladder, then one of these methods should be used. When simple and practical procedures are used there is a much larger margin of safety and the requirements for training are reduced, as well as training retention rates increase.

For questions about the proper use and inspection of your fall protection systems or if you require a site assessment to determine the best fall protection solution for your facility, contact Tritech Fall Protection or visit our website:

www.tritechfallprotection.com

USA 1-833-951-9777

Canada 1-877-287-0808

Thanks to MSA Safety for their coordinated efforts to make this training material available.

MSA The Safety Company