

Occupational Protective Equipment

Introduction

One of the leading occupational dangers in today's workforce is the risk of death or injury due to falls. Falls from ladders, scaffolds, buildings, or other elevations have become the second most significant cause of death in the workplace. (Falls are the number one cause of death in the construction industry.) In addition, falls in the workplace are the third leading cause of injury involving days away from work.

Work-Related Deaths and Injuries by Type of Accident*

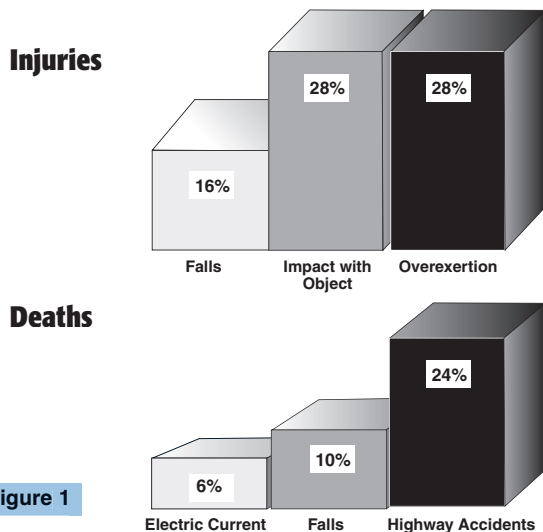


Figure 1

Figure 1: The three major causes of work-related deaths and injuries among American workers are illustrated above. For both number of deaths and injuries, the three causes shown are significantly greater than any other causes. Falls are the second largest cause of deaths and the third largest cause of injuries.

*Source: Bureau of Labor Statistics, U.S. Department of Labor, 1998.

This catalog is a guide to the full line of **Occupational Protective Equipment (OPE)** manufactured by Klein Tools, Inc. to help safeguard professionals in a wide variety of work situations and locations. This specialized OPE catalog is directed to industries concerned with personal occupational protection.

Products in this catalog include the following categories:

- Harnesses
- Connecting Devices
- Lineman's Climbing Equipment
- Pole and Tree Climbers

It is important to note that OPE equipment must be used only for the personal-protective purpose for which it is designed. Misuse can result in serious personal injury or death.



Figure 2

Klein OPE Application Symbols

Klein has developed five easy-to-identify graphic OPE symbols shown in Figure 2 for use throughout the industry. These symbols shown above help to quickly identify the intended use for each OPE item and its function. Each OPE product will have one or more symbols within the product listing as a guide to selection.

Klein components should **NOT** be interchanged with components made by other manufacturers because Klein cannot guarantee that components made by others are properly designed or are free of defects in materials or workmanship.

Klein also publishes a general catalog of hand tools and related equipment used by professional tradesmen in a broad range of industries. The Klein Tools general catalog is available through your local Klein distributor. For additional information regarding OPE equipment, call Klein Tools at 1-800-553-4676.

Klein is a member of major professional trade associations and takes an active role in distributing and promoting the proper use of occupational protective equipment.



WARNING

Read, understand, and follow all instructions, cautions, and warnings attached to and/or packed with all occupational protective equipment before each use. Warning tags for the OPE equipment described in this catalog are reproduced in the appendix.

Government Regulations

The major U.S. governmental agency regulating the use of OPE equipment is the Occupational Safety and Health Administration (OSHA). There are other federal, state, or local regulations that may also apply. This, along with so many different industries, applications, and the fact that there are specific requirements, makes it virtually impossible to discuss specifics about OPE systems without knowing all the job-site facts and application limitations.

Know the appropriate regulations. Learn about the types of protective equipment and systems which must

be used on the job. OSHA requires employers to know and follow all the OSHA regulations pertaining to their industry and to provide a workplace free from hazards that might cause injuries. OSHA provides consultation assistance, at no charge, to employers who need assistance in training and implementation. For an example of current OSHA regulations pertaining to fall-arrest, as of January, 1995, see Figure 3. **If you have any questions or any doubt as to what regulations apply to you or what safety equipment is required, contact your regional OSHA office.**

Figure 3

OSHA Regulations For Personal Fall Arrest Equipment Listed By Industry and Task

Industry	Pertinent To (task)	OSHA Standard(s)
General Industry OSHA Part 1910	Walking-Working Surfaces OSHA Subpart D	See 1910.27 Fixed Ladders and 1910.28 Safety Requirements for Scaffolding
General Industry OSHA Part 1910	Powered Platforms Manlifts and Vehicle Mounted Work Platforms OSHA Subpart F	See 1910.66 Powered Platforms for Building Maintenance and 1910.67 Vehicle Mounted Elevating and Rotating Work Platforms
General Industry OSHA Part 1910	General Environmental Controls OSHA Subpart J	See 1910.146 Permit Required Confined Spaces
General Industry OSHA Part 1910	Special Industries OSHA Subpart R	See 1910.268 Telecommunications and 1910.269 Electric Power Generation, Transmission and Distribution
Shipyards Equipment OSHA Part 1915	Shipbuilding, Repairing and Shipbreaking Operations	See 1915.159 Personal Fall-Protection Equipment
Marine Terminals OSHA Part 1917	Terminal Facilities OSHA Subpart F	See 1917.118 Fixed Ladders
Construction OSHA Part 1926	Scaffolding OSHA Subpart L	See 1926.451 Scaffolding
Construction OSHA Part 1926	Fall Protection OSHA Subpart M	See 1926.501 Duty to Have Fall Protection and 1926.502 Fall-Protection Systems Criteria and Practices
Construction OSHA Part 1926	Cranes, Derricks, Hoists, Elevators and Conveyors OSHA Subpart N	See 1926.550 Cranes and Derricks
Construction OSHA Part 1926	Excavations OSHA Subpart P	See 1926.651 Specific Excavation Requirements
Construction OSHA Part 1926	Steel Erection OSHA Subpart R	See 1926.750 Flooring Requirements
Construction OSHA Part 1926	Power Transmission and Distribution OSHA Subpart V	See 1926.959 Lineman's Body Belts, Safety Straps and Lanyards
Construction OSHA Part 1926	Stairways and Ladders OSHA Subpart X	See 1926.1051 General Requirements

Although the above OSHA regulations, in force as of January, 1995, generally require workers to utilize fall protection when exposed to a fall of six feet or more, Klein strongly recommends using fall-arrest protection when working at any elevated position.



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Occupational Protective Equipment

OPE Systems and the A-B-C Rule

An OPE system is more than just a combination of equipment. In order to function properly, the system must be custom-designed for the specific application, environment, and work-site requirements. A simple rule to follow when assembling an OPE system is the **A-B-C Rule**. The system must contain all of the following components: **(A)** anchorage, **(B)** body wear, and **(C)** connecting device.

(A) Anchorage. OSHA defines anchorage as “a secure point of attachment for lifelines, lanyards, or deceleration devices.” A proper choice of anchorage is determined by the type of fall protection needed (i.e., fall-arrest, or fall-arrest combined with positioning, suspension, retrieval, and/or ladder-climbing functions). The anchorage must be identified and evaluated by a competent person, as defined by OSHA, at the job-site before the appropriate OPE equipment can be selected. Typical anchorages could be an I-beam or other structural members.

(B) Body Wear. OPE harnesses and belts are the second component of an OPE system. In order to select the right harness for the job-site requirements, a competent person, as defined by OSHA, must determine the type of fall protection needed, i.e., fall-arrest, or fall-arrest combined with positioning, suspension, retrieval, and/or ladder-climbing capabilities. Whenever there is a risk of a fall, fall-arrest protection must be used. The use of a body belt for fall-arrest was strictly prohibited by OSHA.

(C) Connecting Device. The third component of an OPE system is the connecting device. Examples include lanyards, rope grabs, and deceleration devices. As with anchorages and body wear, the choice of a proper connecting device is dictated by other system components and job-site requirements. Only use connecting devices equipped with locking snap-hooks. After December 31, 1997, the use of connecting devices without locking snap-hooks for use in any fall-arrest system is strictly prohibited by OSHA.

Remember the A-B-C Rule:

To be complete, an OPE system must include all the components of the A-B-C Rule (anchorage, body wear and connecting device). Some systems may include multiple pieces of OPE equipment for a component. The proper choice of equipment depends on specific job-site facts and application limitations. A competent person, as defined by OSHA, must make these equipment decisions.

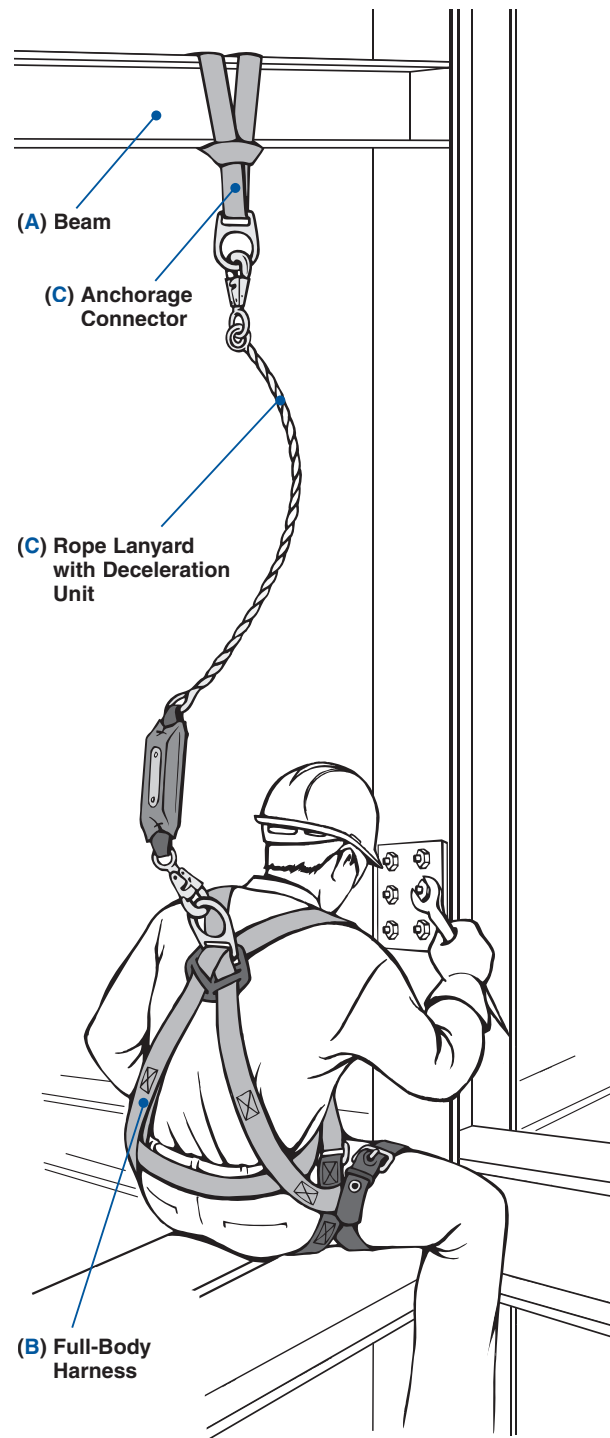


Figure 4

How OPE Systems Are Used

Klein produces personal fall-protection equipment in five OPE system categories. Each type of system and its associated equipment is designed to help protect against different kinds of risks. The risks which require the use of OPE systems and the proper use of OPE equipment must be fully understood. OPE equipment and systems must be used only for the specific purpose for which they are designed and intended. The following information introduces the basic kinds of OPE systems: fall-arrest and fall-arrest combined with positioning, suspension, retrieval, and/or ladder-climbing functions.

Personal Fall-Arrest System

A **personal fall-arrest system** is required if there is any risk of a worker falling from an elevated position (generally, six feet or more). **NOTE: Know the specific OSHA regulations which pertain to your industry.** OSHA defines a personal fall-arrest system as “a system used to arrest an employee in a fall from a working level.” It consists of (A) a fall-arrest anchorage capable of supporting a minimum of 5,000 lbs. (22.2 kN) per attached worker and independent of the worker’s support; (B) a full-body harness designed to distribute the fall-arrest forces over thighs, pelvis, waist, chest and shoulders and equipped with a circle D-ring at the back for attaching a fall-arrest connecting device; and (C) a fall-arrest connecting device, such as a lanyard, deceleration device, lifeline, or a combination of these devices equipped with locking snap-hooks. A personal fall-arrest system is a passive protection system which only comes into service when a fall occurs, similar to a seat belt in a car which restrains the wearer only upon impact. For example, in Figure 4, a fall-arrest system would be used by an ironworker bolting steel beams together for a skyscraper. Following the **A-B-C RULE**, the OPE system includes: (A) beam, (B) full-body harness, and (C) choker anchorage connector and lanyard with a deceleration unit. The outlined area in Figure 5 shows the impact-force distribution for a typical full-body, fall-arrest harness. OSHA requires that impact force in a fall NOT exceed an 1,800 lb. (8 kN) limit with a harness. At a given weight, the longer the free fall, the greater the resulting impact force. To stay under the 1,800 lb. (8 kN) limit, minimize slack in the fall-arrest connecting device. The use of a deceleration unit will also reduce impact forces.

Remember, a personal fall-arrest system only becomes active in a fall. If equipment is required to help hold or place a worker in position, a separate positioning or suspension system must be used in addition to the fall-arrest system. A personal fall-arrest system is designed only to aid a worker once a fall occurs, and must be used whenever there is danger of falling.

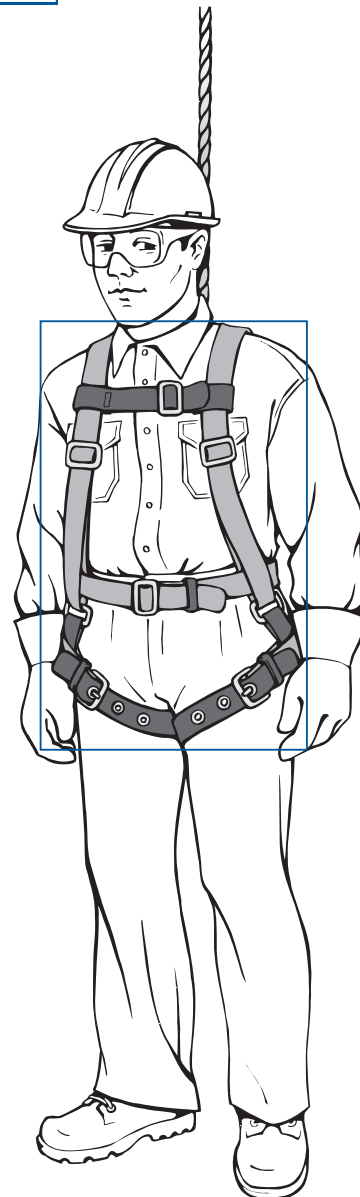


Figure 5

How OPE Systems Are Used

Personal Positioning System

A **personal positioning system** is required if a worker must be held in place while his hands are free to work. OSHA defines a positioning device system as “. . . a body belt or harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.” If there is risk of a worker falling from an elevated position, (generally, six feet or more), personal fall-arrest protection must also be used.

The worker depicted in Figure 6 is utilizing both a personal positioning system and a personal fall-arrest system. Each system has its own **A-B-C** components.

Since the worker's job requires that both hands be free, he is using a *personal positioning system*. The **(A)** component of the personal positioning system is the vertical support that serves as a positioning anchorage. Positioning anchorages must be capable of supporting at least twice the potential impact load of a worker's fall or 3,000 lbs. (13.3 kN), whichever is greater. The **(B)** component of the personal positioning system is the worker's full-body harness which is equipped with a D-ring at each side for attaching a positioning connecting device. The **(C)** component of the personal positioning system is the positioning lanyard which is equipped with a locking snap-hook at each end. Positioning connecting devices must be rigged so that a worker cannot free fall more than 2 feet.

Also, since the worker is at risk of falling, he is also using a *personal fall-arrest system* as described earlier in this section. For the fall-arrest system, the **(A)** component is the pole structure, the **(B)** component is the full-body harness with rear D-ring, and the **(C)** component is the rope lanyard with attached deceleration unit.

In some cases, fall-arrest protection is not possible when using a personal positioning system. For example, a worker building highway pillars or similar structures may have no overhead anchorages available. In these situations, alternative fall-arrest protection devices, such as safety nets, must be used.

A positioning system is an active system and is in use whenever the worker leans back. The positioning body wear provides solid midriff support, leaving the worker's hands free to get the job done.

Remember, a positioning system is only designed to help hold a worker in place while leaving his hands free to work. When used in conjunction with a fixed anchorage, the positioning system can help prevent a fall. However, positioning equipment is **NEVER** a replacement for fall-arrest protection. A positioning system must be used only for the positioning assistance for which it was designed. It must not be relied upon to provide fall-arrest or any other kind of protection. Always use the independent fall-arrest features of a positioning harness. *NOTE: Klein positioning harnesses provide a rear D-ring which must be used for fall-arrest protection.*

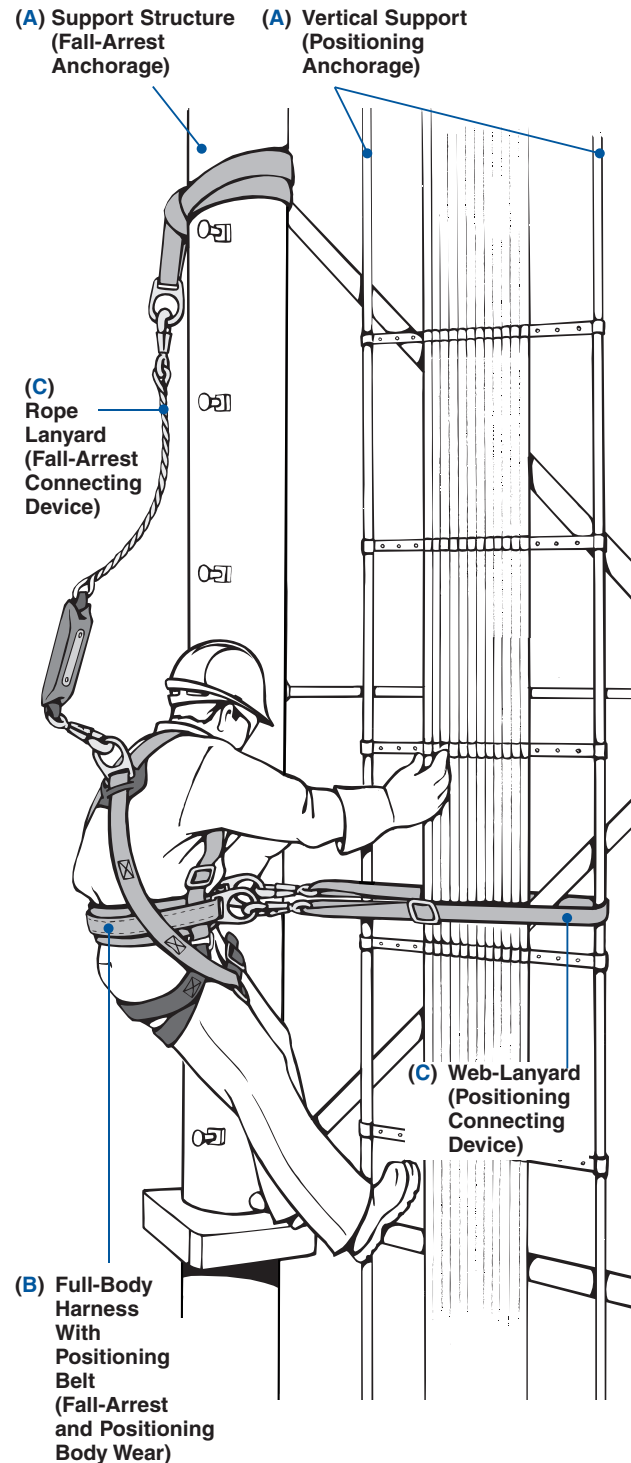


Figure 6

How OPE Systems Are Used

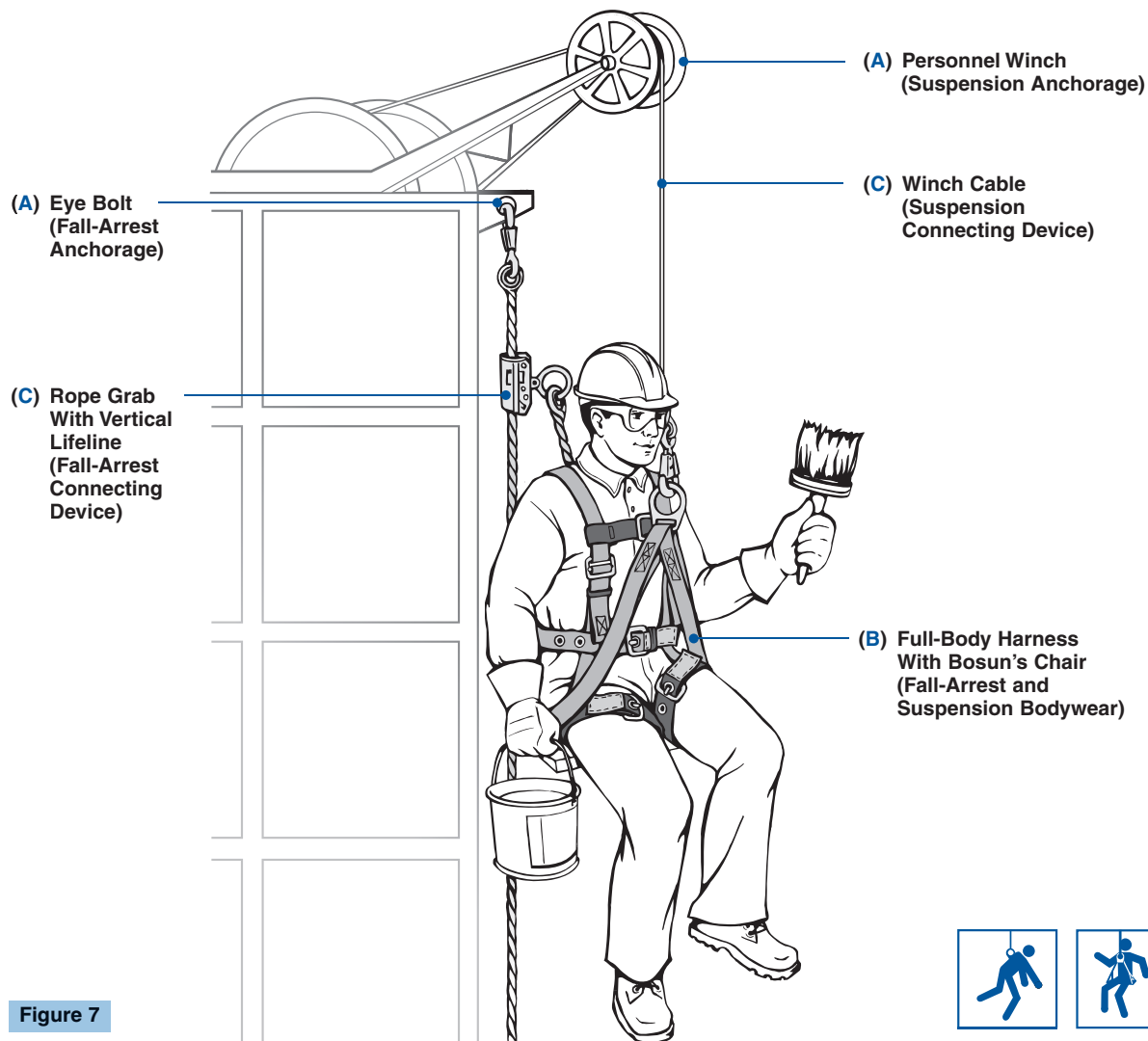


Figure 7

Personal Suspension System

A **personal suspension system** is required when it is necessary to suspend and hold a worker from above. A typical system involves the use of a winch, cable, and either a bosun's chair or a specially designed suspension harness. A suspension system is an active system (used constantly). Fall-arrest protection must always be used with a suspension system.

For example, the painter depicted in Figure 7 is utilizing both a personal suspension system and a personal fall-arrest system. Each system has its own **A-B-C** components. Since the worker must be suspended from above in order to get to his work area, he is using a *personal suspension system*.

The **(A)** component is the winch that serves as a suspension anchorage. Suspension anchorages must be capable of supporting at least twice the potential impact load of a worker's fall or 3,000 lbs. (13.3 kN), whichever is greater. The **(B)** component is the worker's bosun's-chair harness with front suspension D-ring. The **(C)** component is the winch cable, which is equipped with a locking snap-hook.

Also, since the painter is at risk of falling, he is also using a *personal fall-arrest system* as described earlier in this section. For the fall-arrest system, the **(A)** component is the eye-bolt attached to the structure, the **(B)** component is the full-body harness with rear D-ring, and the **(C)** component is the Rope Grab with vertical life line.

Remember, a suspension system is designed to lower, raise, and suspend a worker at an elevated work station. The suspension attachment points on the harness, such as the front D-ring or seat-strap D-rings, are NOT designed to properly distribute the impact forces that result in arresting a free fall. A suspension system cannot be relied upon to provide fall-arrest protection. Always use the independent fall-arrest features of a suspension harness. *NOTE: Klein suspension harnesses provide a rear D-ring which must be used for fall-arrest protection.*

Occupational Protective Equipment

How OPE Systems Are Used

Personal Retrieval System

A **personal retrieval system** is required where a worker may need to be rescued from a work location.

For example, the worker depicted in Figure 8 is using both a personal retrieval system and a personal fall-arrest system. Each system has its own **A-B-C** components.

Since the worker is in an area that may contain potentially hazardous conditions, he is using a *personal retrieval system*. The **(A)** component (which is not shown) is the personnel retrieval winch that serves as part of a retrieval anchorage. Retrieval anchorages must be capable of supporting at least twice the potential impact load of a worker's fall or 3,000 lbs. (13.3 kN), whichever is greater. The **(B)** component is the worker's retrieval harness with shoulder D-rings. The **(C)** component is a V-sling which is equipped with locking snap-hooks.

Also since the worker is at risk of falling, he is also utilizing a *personal fall-arrest system* as described earlier in this section. For the fall-arrest system, the **(A)** component (which is not shown) is a suitable structure which is independent of the retrieval anchorage, the **(B)** component is the worker's full-body harness with rear D-ring, and the **(C)** component is the rope lanyard with locking snap-hooks.

Like a fall-arrest system, a retrieval system is a passive system which only becomes active when the worker needs to be removed from the work location.

Remember, a retrieval system is designed to remove a worker from a work location. A retrieval system by itself, however, may not provide all the fall protection a worker requires. Fall-arrest and positioning functions may also be required. The retrieval shoulder D-rings are NOT designed to properly distribute the impact forces that result in arresting a free fall. A retrieval system cannot be relied upon to provide fall-arrest protection. For fall-arrest protection, always use the independent fall-arrest features of a retrieval harness.

NOTE: Klein retrieval harnesses with shoulder retrieval D-rings also provide a rear D-ring which must be used for fall-arrest protection.

Always Use Fall Protection if There Is a Risk of a Fall

Although OSHA regulations generally require workers to utilize fall protection when exposed to a fall of six feet or more, Klein strongly recommends using fall-arrest protection when working at any elevated position. In addition, OSHA regulations prohibited body belts from being used as part of a fall-arrest system.

Know the appropriate regulations. Learn about the types of protective equipment and systems which must be used on the job. OSHA requires employers to know and follow the OSHA regulations pertaining to their industry, to provide a workplace free from hazards that might cause injuries, and to provide training in rescue

procedures. OSHA provides consultation assistance, at no charge, to employers who need assistance in training and implementation. *If you have any questions or any doubt as to what regulations apply to you or what safety equipment is required, contact your regional OSHA office.*

(A) Personal Retrieval Winch/Anchorage (not shown)

(A) Fall-Arrest Anchorage (not shown)

(C) V-Sling (Retrieval Connecting Device)

(C) Rope Lanyard (Fall-Arrest Connecting Device)

(B) Full-Body Harness (Fall-Arrest and Retrieval Bodywear)

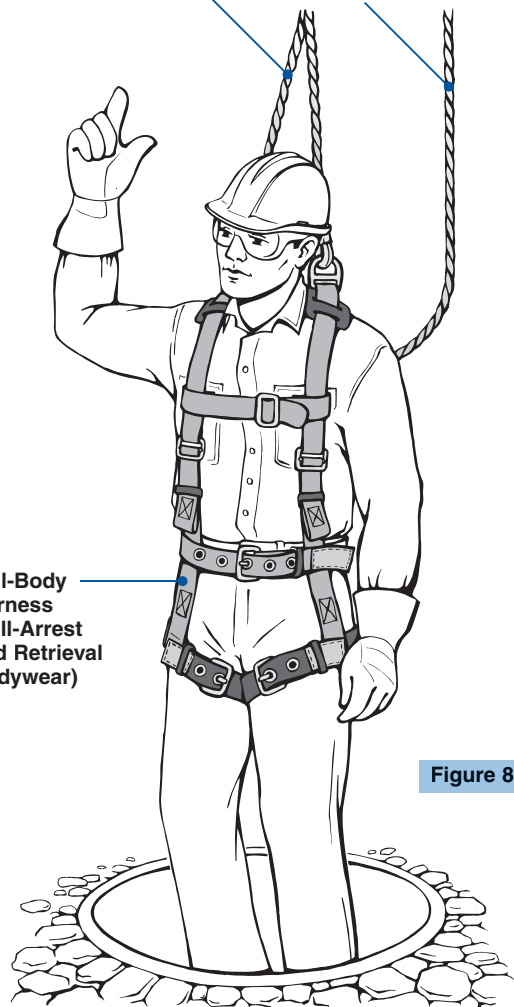


Figure 8



How OPE Systems Are Used

Ladder-Climbing System

A **ladder-climbing system** is used in order to keep a worker's free fall to a minimum in case the worker's hand or foot slips off a ladder rung or foot peg while he is changing elevation to a new work position.

The worker depicted in Figure 9 is utilizing a ladder-climbing system. The worker also has equipment necessary for personal fall-arrest and personal positioning protection, which he will utilize once he reaches his work area. Each system has its own **A-B-C** components.

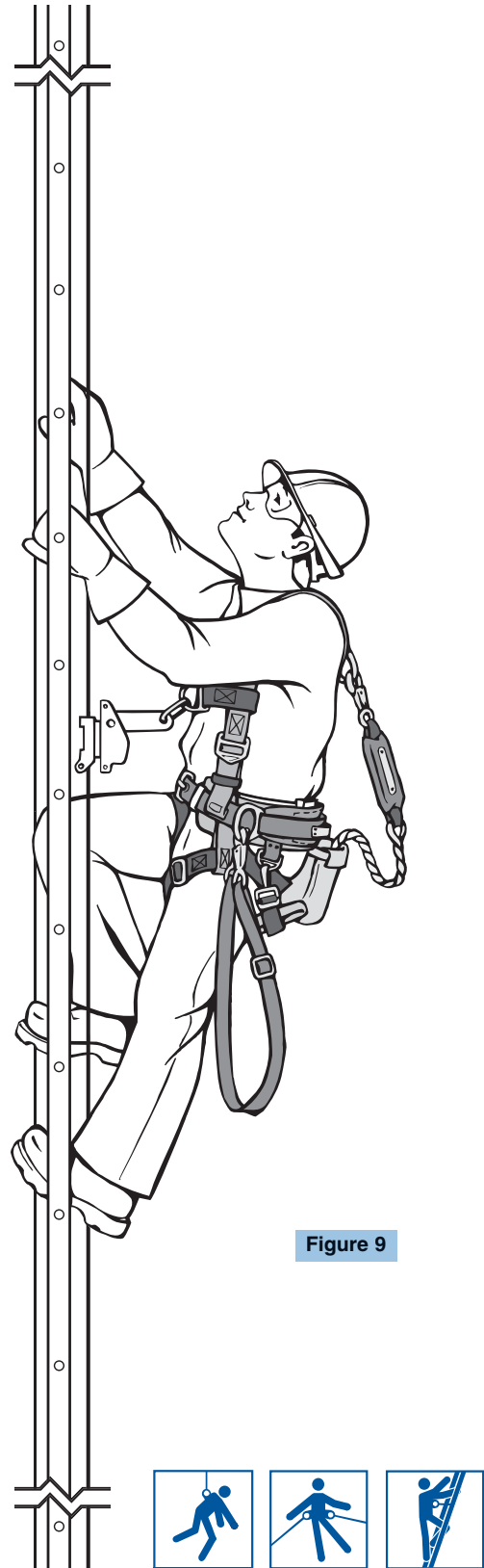
For the *personal ladder-climbing system*, the **(A)** component is the vertical wire attached to the ladder and tower structure that serves as an anchorage for the cable grab device, the **(B)** component is the worker's ladder-climbing harness designed to distribute the forces over thighs, pelvis, waist, chest, and shoulders and equipped with a circle D-ring at the back for attaching a fall-arrest connecting device and a frontal D-ring (not for fall-arrest) for attaching a ladder-climbing device, and the **(C)** component is the cable-grab with locking carabiner which is connected to the ladder. The maximum length of the connection between the center line of the anchorage cable and the frontal D-ring on the ladder-climbing harness shall not exceed 9 inches.

When the worker reaches the work area, and before he unhooks his ladder-climbing system, he must hook up and utilize his *personal fall-arrest system*. For the fall-arrest system, the **(A)** component will be the support structure, the **(B)** component will be the ladder-climbing harness with rear D-ring, and the **(C)** component will be the rope lanyard with attached deceleration unit.

Additionally, if the worker needs to work with both hands free when he reaches his work area, he must hook up and utilize his *personal positioning system* in addition to his personal fall-arrest system. For the positioning system, the **(A)** component will be the vertical support that serves as a positioning anchorage. The **(B)** component will be the ladder-climbing harness which is equipped with a D-ring at each side for attaching a positioning connecting device. The **(C)** component will be the positioning lanyard which is equipped with a locking snap-hook at each end.

It is important to note that a ladder-climbing system is designed to limit a worker's movement while climbing a ladder. The frontal D-ring is NOT designed to properly distribute the impact forces that result in arresting a fall from height. A ladder-climbing system cannot be relied upon to provide fall-arrest protection. When climbing fixed ladders, know and follow ANSI A14.3 (Safety Requirement for Fixed Ladders).

NOTE: Klein ladder-climbing harnesses provide a rear D-ring which must be used for fall-arrest protection and side D-rings for positioning.



Occupational Protective Equipment

How to Select OPE System Components

When selecting OPE equipment, employers must understand the government regulations and the purposes for which specific items are intended. They need to know the specific working conditions and how that equipment must be combined with an anchorage to form a complete OPE system. In addition, the employer must train his workers to identify, maintain, and use OPE equipment correctly. The following instructions are intended to help explain the equipment selection process.

1. Understand the job. Are workers going where they will need fall protection? Will positioning equipment be needed to get the job done? Will it be necessary for a person to be suspended from a structure? Does the job environment require retrieval equipment? Do you need to hold a job-site meeting prior to starting the work? All risks that will be encountered must be taken into consideration. Understand and be prepared to follow rescue procedures.

2. Identify the specific job requirements. Determine suitable anchorages. In addition to personal fall protection, does the job require nets, hand rails, or other non-personal fall protection? Decide whether additional anchorages will be needed and/or if any special engineering will be required to meet safety regulations. If an engineered system for personal fall-arrest protection is required, it shall be designed, installed, and used pursuant to OSHA regulations and under the supervision of a qualified person, as defined by OSHA.

3. Know the appropriate regulations. Learn about the types of OPE equipment and systems that must be used on the job. Know and follow state and local regulations that pertain to your industry. OSHA requires employers to know and follow the OSHA regulations pertaining to their industry and to provide a workplace free from hazards that might cause injuries. OSHA provides consultation assistance, at no charge, to employers who need assistance in training and implementation. *If you have any questions or any doubt as to what regulations apply to you or what safety equipment is required, contact your regional OSHA office.*

4. Determine which OPE system(s) are needed.

Based upon job requirements and appropriate regulations, choose that fall-arrest system or fall-arrest system combined with positioning, suspension, retrieval, and/or ladder-climbing systems that will satisfy the specific requirements. Always follow the **A-B-C RULE**. Each system used must contain at least one **(A)** anchorage, one **(B)** body wear, and one **(C)** connecting device.

5. Select the proper OPE equipment. The major selection criteria for OPE equipment will be dictated by the OPE system(s) required. OSHA's Final Rule of Fall Protection in the Construction Industry requires workers to utilize fall protection when exposed to a fall of six feet or more. The Final Rule also mandates the use of fall-arrest harnesses and locking snap-hooks. Therefore, fall-arrest body belts and non-locking snap-hooks cannot be used.

As described earlier, types of OPE systems offering fall protection are as follows:

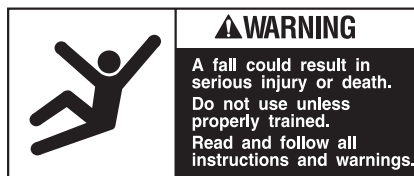
- Fall-arrest systems
- Positioning systems
- Suspension systems
- Retrieval systems
- Ladder-climbing systems

6. Use Klein's identifying symbols. These symbols tell at a glance the intended purpose for each piece of OPE equipment. Symbols help assure selection of the proper equipment.



Fall-Arrest Positioning Suspension Retrieval Ladder Climbing

7. For technical product information, call the Klein Tools Sales Department, toll free at 1-800-553-4676.



⚠WARNING: Never attempt to repair or modify any part or component of any OPE equipment.

⚠WARNING: It is important that a competent person as defined by OSHA select OPE system components to fit the specific job requirements. Incorrect component choices can cause serious injury or death.

NOTE: For clarity, photos in this catalog do not show any warning tags or labels, which are attached to each product.