

Statement of Best Practices of Personal Fall Protection Systems for Aerial Work Platform Equipment



Contributed by:



ASSOCIATION OF
EQUIPMENT MANUFACTURERS



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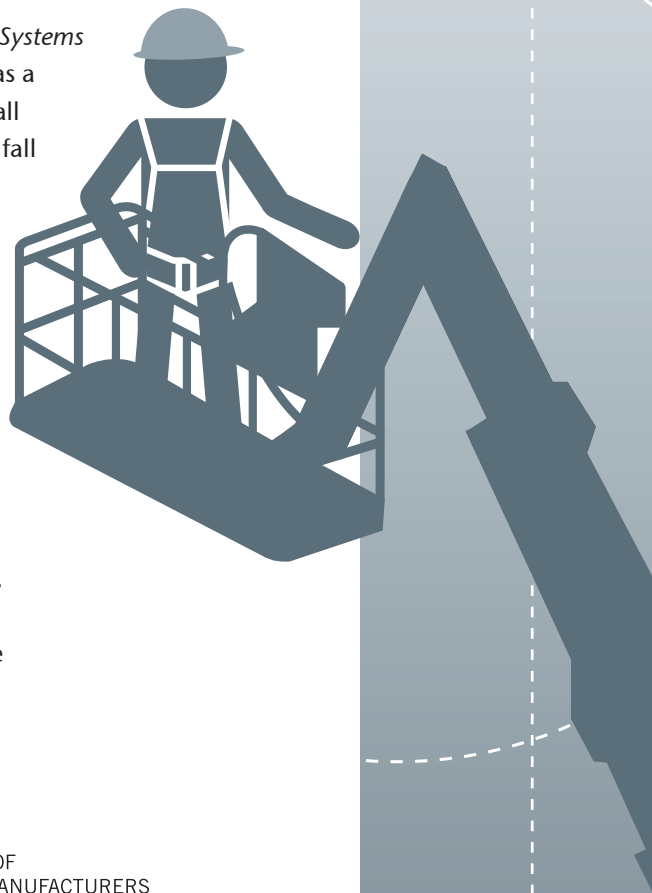
Industry Commitment

All in the industry – rental businesses, manufacturers, associations for those entities, educators, regulators, users and operators – are dedicated to the best practices related to the training and safe use of aerial work platform (AWP) equipment. This equipment offers versatility and assistance to the user. With proper use, projects can be completed successfully while helping to ensure user safety. The priority of all in the industry is to make sure that everyone who owns and operates AWP equipment has a clear understanding of his or her role in the requirements for the safe use of that equipment.

The industry previously joined forces to produce a *Statement of Best Practices of General Training and Familiarization for Aerial Work Platform Equipment*, which identified the roles and responsibilities required by all parties regarding general training and familiarization of this equipment.

The *Statement of Best Practices of Personal Fall Protection Systems for Aerial Work Platform Equipment* has been completed as a general guide for those who want to understand basic fall protection and the best practices for the use of personal fall protection (PFP) systems with AWP equipment. It also is intended for those who do not have a professional safety background and who want an overview of the Occupational Safety and Health Administration (OSHA) regulations and the American National Standards Institute (ANSI) aerial lift standards that define fall protection requirements when using AWP equipment.

The industry has joined forces to provide quality information to those who manufacture, sell, rent or use AWP equipment. We are committed to putting forth initiatives that increase awareness of best practices, clarify responsibilities and address the safe use of AWP equipment. For answers to questions, contact any of the associations that have contributed to this document.



ASSOCIATION OF
EQUIPMENT MANUFACTURERS



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This Statement of Best Practices of Personal Fall Protection Systems for Aerial Work Platform Equipment (this "Statement") developed by the American Rental Association, the Association of Equipment Manufacturers, the Scaffold Industry Association, the Associated Equipment Distributors, and the International Powered Access Federation (collectively, the "Associations") is intended to provide general guidance in basic fall protection and best practices for the use of personal fall protection ("PFP") systems with aerial work platform ("AWP") equipment and to summarize certain standards and regulations published by the American National Standards Institute and the Occupational Safety and Health Administration. The Associations do not purport to include in this Statement all standards and regulations applicable to the use of PFP systems with AWP equipment and any reference in this Statement to such standards and regulations should be read in conjunction with the standards and regulations in their entirety. Each individual or company should use its own independent judgment and discretion in successfully implementing the materials in this Statement to best fit the unique needs of its business.

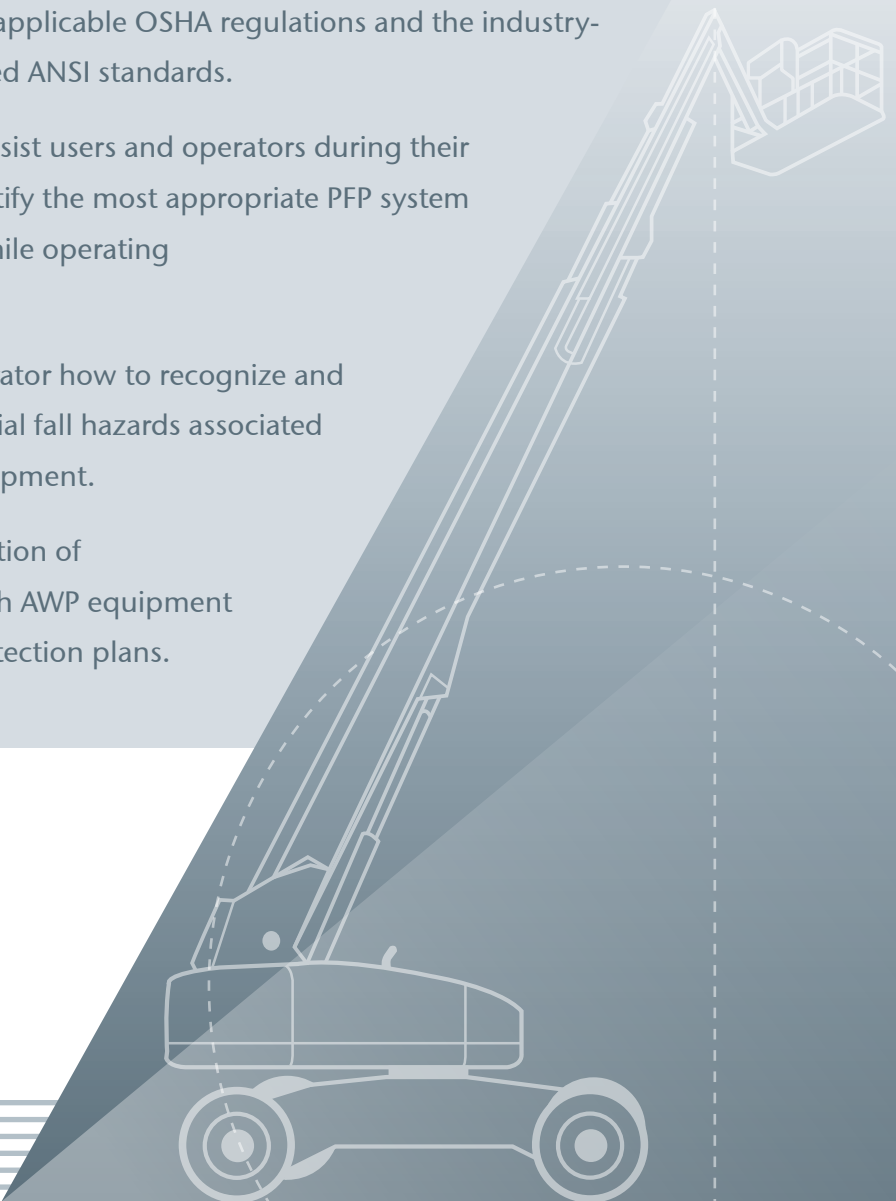
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Section I: Introduction



Members of the AWP equipment industry recognize that there is significant confusion surrounding the selection of the appropriate PFP systems for use with AWP equipment, depending on the job functions of the users and operators. It was decided that a best practices guide, providing some PFP system options along with other useful information, such as a summary of applicable OSHA regulations, was needed. Toward that end, this best practices guide was developed for distribution to users and operators of AWP equipment. This is not intended to be a fall protection manual but rather a targeted guide exclusively for PFP systems used with AWP equipment.

» Objectives

- Educate the industry on applicable OSHA regulations and the industry-recognized and supported ANSI standards.
 - Provide information to assist users and operators during their selection process to identify the most appropriate PFP system for their job functions while operating AWP equipment.
 - Inform the user and operator how to recognize and guard against the potential fall hazards associated with the use of AWP equipment.
 - Encourage the incorporation of best practices for PFP with AWP equipment into a company's fall protection plans.
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Section II: Definitions

The following terms and definitions provide a common understanding when each is referenced throughout this document. Refer to these when reading each section.

Adjuster:	A component that provides a means to vary the length of a strap, webbing or rope.
Aerial (Work) Platform:	A mobile device that has an adjustable position platform, supported from ground level by a structure.
Anchorage:	A secure point of attachment to be used with personal fall protection equipment (PFPE).
Authorized Person:	Personnel approved or assigned to perform a specific type of duty or duties at a specific location or locations at a work site.
Body Belt (safety belt):	A body support comprised of a strap with means for securing it about the waist.
Competent Person:	One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
Connector:	A component or element that is used to couple parts of the system together.
Dealer/Rental Company:	A person or entity who buys from a manufacturer or distributor and who generally sells, rents, and services aerial platforms.
Double-legged Lanyard:	Lanyard with two internally connected legs.
Employer:	Any corporation, partnership, proprietorship, government agency, or other organization that has employees.
Energy (Shock) Absorber:	A component whose primary function is to dissipate energy and limit deceleration forces which the system imposes on the body during fall arrest.
Fall Arrest:	The action or event of stopping a free fall or the instant where the downward free fall has been stopped.
Fall Restraint:	The technique of securing an authorized person to an anchorage using a lanyard short enough to prevent the person's center of gravity from reaching the fall hazard.

Familiarization:	Providing information regarding the control functions and safety devices for the aerial platform(s) to a qualified person or operator who controls the movement of an aerial platform.
Free Fall:	The act of falling before a fall protection system begins to apply forces to arrest the fall.
Free Fall Distance:	The vertical distance traveled during a fall, measured from the onset of a fall from a walking working surface to the point at which the fall protection system begins to arrest the fall.
Full Body Harness:	A body support designed to contain the torso and distribute the fall arrest forces over at least the upper thighs, pelvis, chest and shoulders.
General Training:	Instruction to enable the trainee to become a qualified person regarding the task to be performed, including knowledge regarding potential hazards.
Guardrail System:	A vertical barrier primarily intended to protect against personnel falling to lower levels.
Inspection:	An examination of equipment or systems to assess conformance to a particular standard.
Lanyard:	A component consisting of a flexible rope, wire rope, or strap, which typically has a connector at each end for connecting to the body support and to a fall arrester, energy (shock) absorber, anchorage connector, or anchorage.
Manufacturer:	A person or entity who makes, builds or produces equipment.
Maximum Arrest Force:	The peak force experienced by the user during arrest of a fall using a personal fall arrest system.
Operator:	A qualified person who controls the movement of an aerial platform.
Owner:	A person or entity who has possession of an aerial platform by virtue of proof of purchase.
Personal Fall Arrest System (PFAS):	An assembly of components and subsystems used to arrest a person in a free fall.
Personal Fall Protection (PFP) System:	Any equipment, device or system that protects a person from experiencing an accidental fall from elevation or that mitigates the effect of such a fall.

Program Administrator:	A person authorized by their employer to be responsible for managing the employer's fall protection program.
Qualified Person:	One who, by possession of a recognized degree, certificate, or professional standing, or by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.
Rescue:	The process of removing a person from danger, harm, or confinement to a safe location.
Rescue Plan:	A written process that describes in a general manner how rescue is to be approached under the specified parameters, such as location or circumstances.
Risk Assessment:	A plan developed by a competent person to identify the steps of the work, the hazards associated with each step, and controls to mitigate or eliminate the hazards identified.
Self-retracting Lanyard (SRL):	A device containing a drum-wound line that automatically locks at the onset of a fall to arrest the user, but that automatically pays out from and retracts onto the drum during normal movement of the person to whom the line is attached. After onset of a fall, the device automatically locks the drum and arrests the fall.
Swing Fall:	A pendulum-like motion that occurs during and/or after a vertical fall. A swing fall results when an authorized person begins a fall from a position that is located horizontally away from a fixed anchorage.
User (of AWP Equipment):	Person(s) or entity(ies) that has care, control, and custody of the aerial platform. This person or entity may also be the employer of the operator, a dealer, employer, owner, lessor, lessee, or operator.
User (of PFP System):	A person who performs activities at heights while protected by a personal fall protection system.

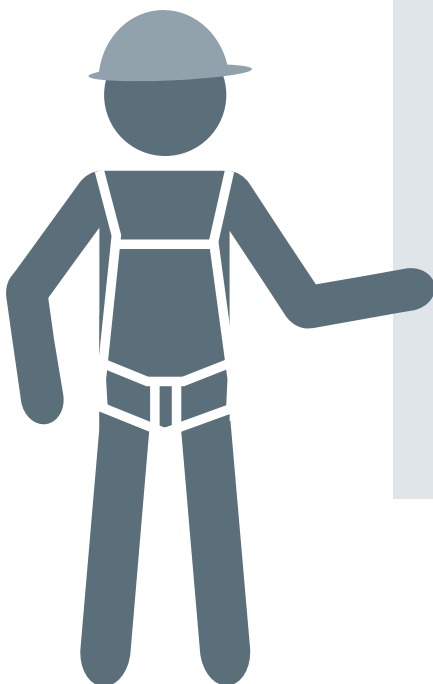
Section III: Situation Analysis

Fall protection is an important issue for those who use AWP equipment. While the guardrail system is the primary fall protection, a fall restraint or a fall arrest system is required with all boom-supported elevating work platforms (refer to OSHA 1926.453(b)(2)(v) and ANSI/SIA A92.5 7.10(1)). The issue facing the industry is to determine the appropriate system or systems to use. (It may be both.)

ANSI and OSHA provide standards and regulations, respectively, that address this subject. (See “OSHA Regulations, ANSI Standards and Manufacturers’ PFP Recommendations” later in this document.)

The questions surrounding selection of a PFP system were brought into focus in January 2009 when OSHA issued a letter of interpretation regarding the fall protection equipment manufacturer-stipulated minimum anchor point elevation of 18½ feet precluding the use of a shock-absorbing lanyard in AWP equipment. The fall arrest system referred to in the question included a 6-foot lanyard with shock absorber and full-body harness. The specific question was: *“Since at times the distance between a lift’s work platform and a lower level will be less than 18½ feet, does the [fall protection equipment] manufacturer’s instruction regarding the minimum anchor point elevation preclude its use as part of a fall protection system in an aerial lift?”* According to OSHA, use of this PFP system (6-foot lanyard with shock absorber) would not be allowed in this application.

The OSHA letter of interpretation has created a dilemma for the industry. The answer from OSHA refers to existing OSHA regulations 1926.502d(16)(iii) requiring anchorages to *“be rigged such that an employee can neither free fall more than 6 feet, nor contact any lower level.”* Although this regulation has been in place for some time, the general practice in the industry has been to use a 6-foot lanyard with a shock absorber. An OSHA citation generally was seen only when **no PFP** system was used at all.



Now, users are facing the issue of deciding what PFP equipment is compliant. That decision must address all pertinent fall protection requirements. The choice requires a competent person to evaluate and determine the proper PFP equipment for the application.

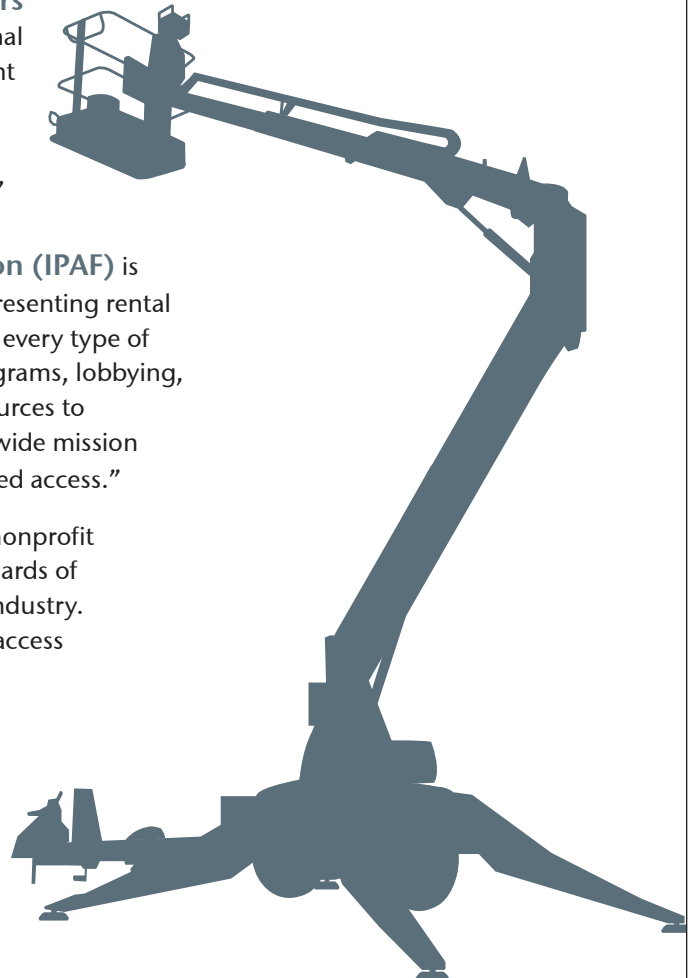
Many in the industry — especially rental companies and users — are questioning what is an acceptable replacement for the 6-foot lanyard that was the most commonly used PFP equipment. This best practice guide will assist in addressing the requirement.

Section IV: Current AWP Equipment Associations, Governing Bodies and Standards

Associations

The associations involved in this effort include:

- **American Rental Association (ARA)** is the international trade association for the equipment rental industry, including rental businesses and suppliers to the industry. ARA provides educational, insurance/risk management, business management and marketing resources; networking opportunities; industry research; and legislative and regulatory advocacy for its members.
- **Associated Equipment Distributors (AED)** is an international trade association representing companies involved in the distribution, rental and support of equipment used in construction, mining, forestry, power generation, agriculture and industrial applications. AED enhances the ongoing success and profitability of its member companies and related constituencies through public policy advocacy; industry education, training and career development; networking opportunities; as well as research, and performance benchmarks.
- **Association of Equipment Manufacturers (AEM)** is the North American-based international trade group representing the off-road equipment manufacturing industry, and its members manufacture equipment, products and services used worldwide in the agriculture, construction, forestry, mining and utility sectors.
- **International Powered Access Federation (IPAF)** is the specialist international trade association representing rental companies, manufacturers and the end users of every type of aerial work platform. IPAF provides training programs, lobbying, market research, business advice and other resources to members and nonmembers as part of its worldwide mission to “promote the safe and effective use of powered access.”
- **Scaffold Industry Association (SIA)** is a nonprofit trade association committed to raising the standards of professionalism within the scaffold and access industry. The SIA represents all facets of the scaffold and access industry. Through its various programs, the SIA promotes safety, training and a highly professional, responsible image of the scaffold and access professional. The SIA is also the secretariat for the American National Standard, Accredited Standards Committee (ASC) A92 Standards.





Governing Bodies

The governing body that provides guidelines and regulations includes:

■ Occupational Safety & Health Administration (OSHA)

is an agency of the U.S. Department of Labor and the main federal agency charged with the development and enforcement of safety and health legislation. Under the Occupational Safety and Health (OSH) Act of 1970, OSHA's role is to assure safe and healthful conditions for working men and women by authorizing enforcement of the standards developed under the Act, by assisting and encouraging the states in their efforts to assure safe and healthful working conditions, by providing for research, information, education and training in the field of occupational safety and health.

Standards

American National Standards Institute (ANSI) is the voice of the U.S. standards and conformity assessment system. The Institute oversees the creation, dissemination and the use of thousands of norms and guidelines that directly impact businesses in nearly every business sector.

Various organizations serve as secretariats for standard development. These secretariats form committees that develop and maintain the standard(s), ensure that the process of revision is timely and in accordance with ANSI procedures, and publish the final products of the consensus process. The goal is to make each committee a balance of interested classes, which could include consumers/users, distributors/dealers, experts, regulatory agencies, manufacturers, testing laboratories, not-for-profit or for-profit entities, etc.

■ **The Scaffold Industry Association (SIA) serves as a secretariat for the ASC A92 Main Committee.**

ASC A92 Standards are applicable to U.S. operations. They are used by manufacturers, dealers, owners, users and operators of AWP equipment. The purpose of the standards is the proper and safe use of machines and the prevention of accidents and injuries. These standards also establish criteria for the manufacturers as well as aid the manufacturers, dealers, owners, users and operators of AWP equipment to understand their various responsibilities. This document references the following A92 Standards:

- A92.2 Vehicle-mounted Elevating and Rotating Aerial Devices (trailer-mounted boom lifts)
- A92.3 Manually Propelled Elevating Aerial Platforms (push-around)
- A92.5 Boom-supported Elevating Work Platforms (boom lifts)
- A92.6 Self-propelled Elevating Work Platforms (scissor lifts)
- A92.8 Vehicle-mounted Bridge Inspection and Maintenance Devices

The A92 Standards are published in two forms:

- Full ANSI/SIA A92 Standards
- ANSI/SIA Manuals of Responsibilities are abbreviated versions of the full ANSI/SIA A92 Standards. They contain everything that is in the full standards except Sections 1 and 2 of the standard and the manufacturers' responsibilities.

■ **The American Society of Safety Engineers (ASSE) serves as secretariat for the Safety Requirements for Construction and Demolition Operations, A10 and Fall Protection, Z359 committees.**

This document references the following A10 and Z359 Standards:

- A10.32 Fall Protection Systems for Construction and Demolition Operations
- Z359.0 Definitions and Nomenclature Used for Fall Protection and Fall Arrest
- Z359.1 Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
- Z359.2 Minimum Requirements for a Comprehensive Managed Fall Protection Program
- Z359.3 Safety Requirements for Positioning and Travel Restraint Systems
- Z359.4 Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components
- Z359.6 Specifications and Design Requirements for Active Fall Protection Systems
- Z359.12 Connecting Components for Personal Fall Arrest Systems
- Z359.13 Personal Energy Absorbers and Energy Absorbing Lanyards

Section V: ANSI and OSHA Roles and Compliance Requirements

Roles of ANSI and OSHA

ANSI promotes safety in the industry by developing recommendations in the form of standards and guidelines. While ANSI standards are considered recommended guidelines, they are not laws or regulations. Complying with ANSI standards is **voluntary**.

OSHA is an agency of the U.S. government that issues and enforces regulations for employers to ensure workplace safety and health. Though the regulations are often referred to as standards, they are in fact federal laws and therefore compliance is **mandatory**.

Reasons for Complying

ANSI standards and OSHA regulations are often confused because they generally address the same issues. In fact, many OSHA regulations were written based on ANSI standards. Also, OSHA often adopts ANSI standards via “incorporation by reference.” When standards are adopted or incorporated, they become part of the OSHA regulation and are no longer voluntary.

To the extent that the current ANSI standards are not incorporated into OSHA regulations, the ANSI standards are voluntary. However, ANSI standards provide guidance as to what may be considered the standard of care. If you comply with ANSI standards, you may have an argument for a defense against claims under OSHA’s “general duty” clause, which requires employers to keep the workplace “free from recognized hazards.”

OSHA refers to ANSI standards for industry best practices.

OSHA has written many rules in the Code of Federal Regulations (CFR), but in some cases has adopted consensus standards to be used as minimum guidelines by their reference in the Code of Federal Regulations. In 1974, they adopted many of the ANSI and National Fire Protection Association (NFPA) standards in order to promote safety rules. In this particular time frame, there was only one aerial lift standard, A92.2-1969 for vehicle-mounted elevating and rotating work platforms.

ANSI has since created other standards for other types of aerial lifts and OSHA recognizes these consensus standards. OSHA also has referenced these consensus standards through interpretive letters regarding compliance.

All contributing organizations fully support the ANSI/SIA A92 Standards as the recognized standards for AWP equipment. The associations and their members are actively involved on the ASC A92 Main and Subcommittees. Incorporating changes regarding PFP systems into these ANSI/SIA publications is a long-term goal of these organizations.

Section VI: OSHA Regulations, ANSI Standards and Manufacturers' PFP Recommendations

OSHA Fall Protection Regulations

The following OSHA regulations specify the requirements for **fall restraint or fall arrest while working in a boom-supported aerial lift**. Employers are responsible for providing PFP equipment and ensuring that it is used properly.

OSHA 1926 Regulations Governing Construction

- 1926.453(b)(2)(v): *“A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift. Note to paragraph (b)(2)(v): As of January 1, 1998, subpart M of this part (1926.502(d)) provides that body belts are not acceptable as part of a personal fall arrest system. The use of a body belt in a tethering system or in a restraint system is acceptable and is regulated under 1926.502(e).”*
 - 1926.453 covers aerial lifts that are boom type. Although OSHA does not have specific requirements for PFP when operating scissor lifts, requirements for their operation are provided in 1926.452(w), which addresses all other mobile (scissor) lifts.
 - 1926 Subpart M covers fall protection in its entirety and explains when and where fall protection systems are required and for which construction work activities. It also defines system component requirements. This section is referenced in the January 2009 OSHA letter of interpretation because of the potential of “contacting a lower surface.” (See the Basic Fall Clearance Calculation diagram on page 26.)
 - 1926.502(d)(20): *“The employer shall provide for prompt rescue of employees in the event of a fall or assure that employees are able to rescue themselves.”*
 - The time of an incident is not the time to figure out how to promptly rescue a person in a fall. Prior training and practice will ensure that individuals are prepared to address the needs of someone who has fallen.
 - 1926.503(a): *“The employer shall provide a training program for each employee who might be exposed to fall hazards.”*
 - The program shall enable the employee to recognize the hazards of falling and shall train each employee in the procedures, the use, inspection and maintenance of the fall protection system to be used.
 - 1926 Subpart E covers some requirements for personal protection equipment.
- What is a prompt rescue? OSHA will refer to research indicating that suspension trauma in a fall arrest device can result in unconsciousness followed by death in less than 30 minutes. A U.S. Air Force study showed adverse effects to a person after 15 minutes. OSHA interprets that to be “in time to prevent serious injury to the worker.”

OSHA 1910 Regulations Governing General Industry

Choosing the proper PFP equipment for use with AWP equipment is only one of the requirements for providing proper and adequate PFP. If you elect a fall arrest system, for instance, you will be required to address fall rescues.

- 1910 Subpart F covers fall protection as it pertains to powered platforms, manlifts and vehicle-mounted work platforms.
- 1910.67(c)(2)(v): *“A body belt shall be worn and a lanyard attached to the boom or basket when working from an aerial lift.”**
*The lanyard anchorage connector must be attached to the AWP equipment’s anchor point.
- 1910.66 Appendix C Personal Fall Arrest Systems requires that the employer shall provide for prompt rescue of employees in the event of a fall or shall assure the self-rescue capability of employees, and before using a personal fall arrest system and after any component or system is changed, employees shall be trained in accordance with the requirements of paragraph 1910.66(i)(1), in the safe use of the system.

What is a prompt rescue? OSHA will refer to research indicating that suspension trauma in a fall arrest device can result in unconsciousness followed by death in less than 30 minutes. A U.S. Air Force study showed adverse effects to a person after 15 minutes. OSHA interprets that to be *“in time to prevent serious injury to the worker.”*

OSH Act of 1970

Section 5(a)(1), which is called the “General Duty Clause,” serves as the catch-all section that OSHA uses to require all employers to provide a safe workplace for their employees. A quick layman’s definition of this section is that if an action or situation looks unsafe and there are no OSHA rules that govern the act, then OSHA will cite it under this clause.

■ Section 5. Duties:

(a): **Each employer:**

(1): *“shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;”*

(2): *“shall comply with occupational safety and health standards promulgated under this Act.”*

(b): *“Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.”*

ANSI Standards

The ANSI/SIA A92.5-2006 Standard for boom-supported elevating work platforms establishes responsibilities of users, operators and owners. The standard requires users to ensure that their authorized operators follow proper guidelines and instructions. The user is also required to direct and monitor the operators to be in compliance with the provision set forth in the standard. Section 7.10 (1) defines the requirements for fall protection. The principal fall protection is provided by the guardrail system. The user shall direct the operator to ensure that all the components of the guardrail system are in place. **The user also must direct and monitor the operator(s)/occupant(s) of the AWP equipment to ensure that each person wears a personal fall arrest system to protect against the potential effects of ejection or a fall restraint system to prevent a free fall. The user may elect to use either a restraint or an arrest system.** The standard briefly describes a fall restraint and fall arrest system.

Responsibilities of the operators regarding fall protection are described in Section 8.6 (3), 8.8 (2) and (4), and 8.10 (1). Operators are required to ensure that guardrails are installed and positioned and that access gates, or openings, are properly closed. Additionally, operators must ensure that all occupants are wearing appropriate personal protective equipment. **Operators are required to wear fall restraint or fall arrest equipment – as directed by their employer – which is attached to the AWP equipment’s anchor point.**

Owners, when in the role of a user, have the same obligations as indicated in Sections 7.10, 8.6 and 8.8 with respect to fall protection. Manufacturers and dealers do not have any specific requirements per the ANSI/SIA A92.5 Standard except when in the role of user or owner, where they need to comply with the above referenced sections as well. **Manufacturers and dealers do not have an obligation to ensure a PFP system is used by their customers, but they do have an obligation to ensure that fall protection, in the form of the guardrails, is in proper working order at the time of delivery or sale.**

Refer to ANSI/SIA A92.2 and 92.9 Standards for what is specified in those standards regarding fall protection.

ANSI/ASSE A10.32-2004 Standard for fall protection systems defines requirements for the selection, inspection, use, care and maintenance of the equipment and for training and supervision of the users of the equipment. Once the equipment is selected, training must be provided to the employee regarding the inspection, safe use, care and maintenance, plus training and annual drills regarding rescue.

ANSI/ASSE Z359 Standards require employers to have a comprehensive fall protection program that includes: 1) drafting a policy statement that includes goals and guidance for a managed program 2) appointing a program administrator 3) eliminating or controlling fall hazards 4) developing and maintaining fall protection and rescue procedures and 5) providing PFP equipment, knowledge and training.

The emergency rescue plan includes:

- Methods of rescue
- Rescue personnel availability
- Type of equipment available for rescue and effective means to contact rescue personnel
- Annual drills for rescue

OSHA and ANSI/SIA Regulations as Applied to the Various Types of AWP Equipment

OSHA regulations require the occupant(s) of a boom lift to wear PFP equipment while in the platform. This would include:

ANSI Standard	PFP Requirement
ANSI A92.2 Vehicle-mounted Elevating and Rotating Aerial Devices	Use of approved PFP equipment is required.
ANSI A92.5 Boom-supported Elevating Work Platforms	Use of approved PFP equipment is required.
ANSI A92.8 Vehicle-mounted Bridge Inspection and Maintenance Devices	Use of approved PFP equipment may be required based on platform area and additional considerations.

Neither OSHA nor ANSI require the occupant(s) working from self-propelled and manually propelled elevating work platforms to wear PFP equipment except when components of the guardrails are not in place. This would include:

ANSI Standard	PFP Requirement
ANSI A92.3 Manually Propelled Elevating Aerial Platforms	The guardrail provides fall protection. Additional PFP is not required unless any component of the guardrail is not in place.
ANSI A92.6 Self-propelled Elevating Work Platforms	The guardrail provides fall protection. Additional PFP is not required unless any component of the guardrail is not in place.

Manufacturers' PFP Recommendations

The manufacturers of AWP equipment and the manufacturers of PFP equipment provide users of their equipment specific PFP-related recommendations for the safe use of their products.

AWP equipment manufacturers:

- Operator's manuals from the AWP manufacturer are required to be in the weather-resistant compartment on every lift. The operator's manual provides users and operators PFP instruction that must be complied with.

PFP manufacturers:

- They provide instruction manuals, technical bulletins and safety references that users must read, understand and comply with when using PFP equipment.

The need for PFP equipment will result from a job-specific risk analysis undertaken prior to starting work, which takes into consideration the AWP equipment manufacturer's operator's instructions as found in the operator's manual. **Note that there also may be company policies, or job-site or local requirements for the use of a PFP system with AWP equipment.**

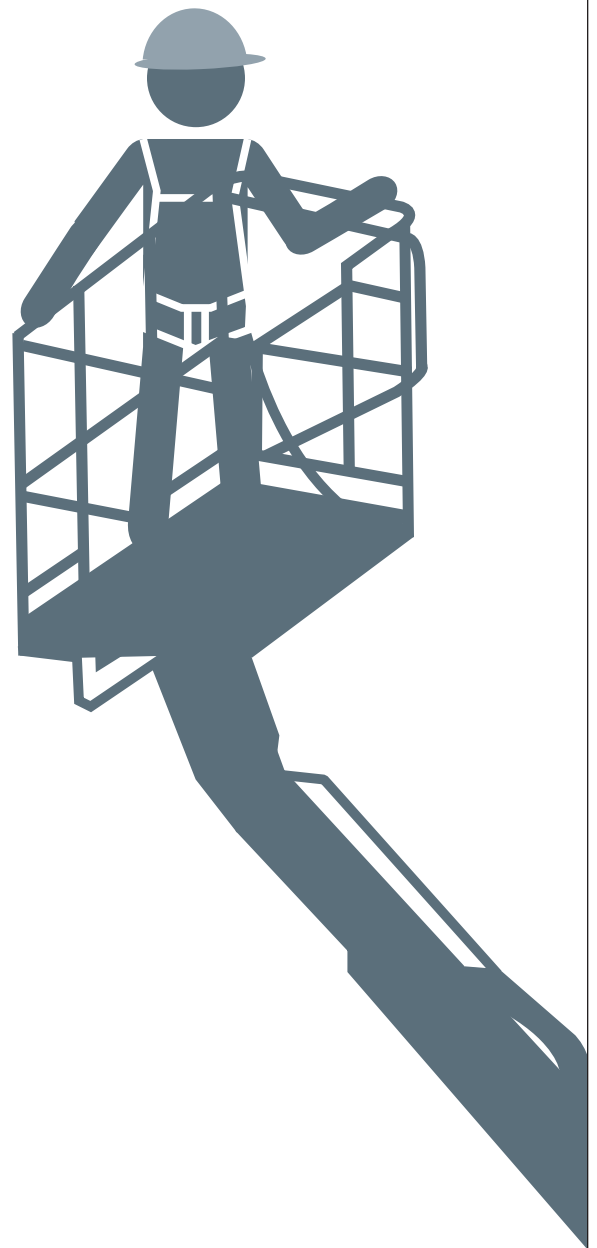
Section VII: Personal Fall Protection System Options for Use with AWP Equipment

It is an OSHA requirement that a PFP system be provided to occupants of boom-type lifts in addition to the guardrail system. The two types of PFP systems are fall restraint and fall arrest. Appropriate PFP systems have the following characteristics that should be considered during selection:

- They prevent falls or protect occupants who do fall.
- They minimize interference with the occupants' tasks or activities.
- They are affordable.

Determining which fall arrest system to use isn't so easy with the requirement referred to in the OSHA regulations as well as the 2009 OSHA letter of interpretation, which requires anchorages to *"be rigged such that an employee can neither free fall more than 6 feet, nor contact any lower level."*

In addition, the location of anchorage points on AWP equipment varies. They can be located anywhere from the platform floor to the top guardrail. The location must be considered when selecting a PFP system.



Considerations

On pages 18 and 19 of this document, there are four fall restraint/arrest options outlined. New developments and products, which are not specifically mentioned here, are being continually introduced. They may be acceptable for AWP equipment PFP. A competent person must evaluate all PFP systems and ensure that all of the requirements for either fall restraint or fall arrest — or both — are in place prior to use. During the selection process, utilize the information in Section X: Implementing a Fall Protection System, which includes the Basic Fall Clearance Calculation diagram on page 26.



Option No. 1:

Fall Restraint Using a Short Lanyard

Comprised of a platform anchorage, belt or harness, and a lanyard connector, a fall restraint system prevents a fall of any distance from the AWP equipment. In the case of a boom lift, the forces from the “catapult effect” would not cause the occupant to be thrown from the platform but rather remain within the confines of the work platform.

The connection from the anchorage to the belt or harness is the lanyard. The length of the lanyard is critical in the ability of the system to prevent a fall. The location of the anchorage point on the AWP equipment and the height of the occupant also are critical in the determination of what length lanyard is appropriate for restraint. A short-length lanyard may be used to obtain the necessary restraint of the occupant.



Option No. 2:

Fall Restraint/Arrest Using a Lanyard with an Adjuster

Since the occupant(s) may use PFP equipment for different applications other than boom lift operation and need to move within the platform where appropriate, a lanyard with an adjuster may be the best option for some. Lanyards with adjusters are available in various lengths. When determining the length required, ensure that the shortest lanyard length will provide a fall restraint from the lanyard with an adjuster chosen. The maximum-length lanyard should be as short as possible at all times.

The lanyard with an adjuster allows the occupant(s) to have either a fall restraint system or a fall arrest system, depending on the adjusted length of the lanyard. When the lanyard with an adjuster is to be used as a fall arrest system, it is required that a deceleration device (commonly known as a shock absorber) be incorporated into the lanyard with an adjuster. The deceleration device would be in place while in restraint or arrest position.

The use of the lanyard with an adjuster as a fall arrest system requires the following:

- The assurance that when fall arrest is used, a fall will not allow the occupant(s) to come in contact with a lower surface or free fall more than 6 feet.
- The employer has a rescue plan in place.

If either of these requirements cannot be met, a fall arrest system cannot be used.



Option No. 3:

Fall Restraint/Arrest Using a Double-legged Lanyard

A double-legged lanyard is equipped with a restraint (short) lanyard and an arrest (long) lanyard with an energy (shock) absorber. In a manner similar to the lanyard with an adjuster, the short lanyard would be used as fall restraint during travel. The arrest lanyard may be used only as fall arrest. The length of the restraint lanyard is determined by the length required to prevent the occupant(s) from falling out of the AWP equipment (restraint).

The use of the double-legged lanyard as a fall arrest system requires the following:

- The assurance that when fall arrest is used, a fall will not allow the occupant(s) to come in contact with a lower surface or free fall more than 6 feet.
- The employer has a rescue plan in place.

If either of these requirements cannot be met, a fall arrest system cannot be used.



Option No. 4:

Fall Restraint/Arrest Self-retracting Lanyard (SRL)

One additional option is a self-retracting lanyard (SRL). The SRL selected must be one that the SRL manufacturer approves for use with the specific AWP equipment. Some SRLs are not designed to have the anchorage point below the connection point on the occupant(s). Read the requirements defined by the SRL manufacturer to ensure compliance with it before using the SRL.

As with fall arrest systems, ensure that there is proper anchorage and clearance from lower surfaces. Note that when the AWP equipment is moving, the SRL must be adjusted to restraint mode.

The use of the self-retracting lanyard as a fall arrest system requires the following:

- The assurance that when fall arrest is used, a fall will not allow the occupant(s) to come in contact with a lower surface or free fall more than 6 feet.
- The employer has a rescue plan in place.

If either of these requirements cannot be met, a fall arrest system cannot be used.

Section VIII: Lanyard Anchorages

Anchorages, which have either been AWP manufacturer-approved and integrated into the work platform structure or have been supplied by the AWP manufacturer for attachment to the platform, must be used as the attachment point.

As stated in the ANSI/SIA A92 Standards, only one person is allowed to attach to a single anchorage unless the anchorage has been rated for more than one person. The number of allowable lanyard attachments on a single anchorage is generally identified near the anchorage and in the machine's operator's manual.

The guardrails or guardrail system should not be used as a lanyard anchorage point unless it has been specifically designed to do so by the manufacturer and instructions for use have been supplied in the operator's manual.

Most requirements for fall protection anchorages can be determined from the parameters set forth by OSHA and ANSI.

ANSI/SIA A92.2, Vehicle-mounted Elevating and Rotating Aerial Devices (4.9.4)

ANSI/SIA A92.5, Boom-supported Elevating Work Platforms (4.12.5.3)

ANSI/SIA A92.8, Vehicle-mounted Bridge Inspection and Maintenance Devices (5.14.4.6)

- *"The anchorage(s) shall be capable of withstanding the force of 3,600 pounds (16,000 N) ..."*

ANSI/ASSE Z359.1, Safety Requirements for Personal Fall Arrest Systems (PFAS), Subsystems and Components

- 7.2.3: *"Anchorages selected for PFAS shall have a strength capable of sustaining static loads, applied in the directions permitted by the PFAS, of at least:*
 - (a) two times the maximum arrest force permitted on the system when certification exists, or*
 - (b) 5,000 pounds (22.2 kN) in the absence of certification ..."*

Some applicable OSHA Code of Federal Regulations (CFR) are stated below:

- **1910.66 App C I.2(c)(10):** *“Anchorages to which personal fall arrest equipment is attached shall be capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least two, under the supervision of a qualified person.”*
- **1926.502(d)(15):** *“Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed, and used as follows:

(i) as part of a complete personal fall arrest system, which maintains a safety factor of at least two; and ...”*

Ultimately, all of these requirements agree that engineered anchorages must be capable of withstanding a force of 3,600 pounds for each person allowed to be attached to the anchor. This is double the maximum allowable arrest force of 1,800 pounds, providing a 2 to 1 factor of safety. The 5,000-pound requirement often discussed is only for those potential anchorages that are not specifically engineered to be fall protection anchorages.

Section IX: Planning to Prevent Falls

Most falls involving AWP equipment can be traced to operator error and/or improper use. Reasons for falls may include:

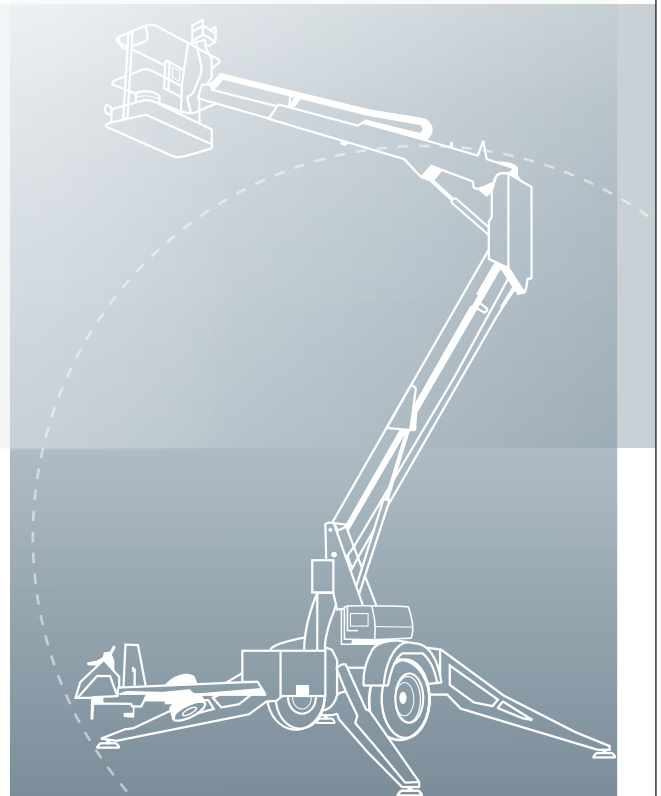
- Occupant is not wearing required PFP equipment or is not attached to anchorage point.
- Occupant is ejected or catapulted from a boom lift when it is struck by another vehicle or object, or moves unexpectedly.
- Occupant climbs on guardrails or out of the platform.
- Occupant overreaches beyond the edge of the platform.
- Platform component failure occurs due to improper maintenance or inspection.

As mentioned earlier, AWP equipment provides a safe means to access work at heights when properly maintained and operated by trained and familiarized operators who are appropriately monitored and supervised by their employer. One of the best ways to prevent fall hazards is through proper training and planning. A risk assessment of all fall hazards, even potential fall hazards, must be completed before appropriate corrective measures can be considered. A complete risk assessment of the fall hazard will include training requirements and defining rescue plans in the event of a fall.

A company's fall protection plan for a work site can include the use of AWP equipment. In fact, this equipment can be used as a tool to prevent falls because AWP equipment offers a fully guardrailed platform that elevates to the work location. The use of an appropriate PFP system should be part of the plan.

Prior to the implementation of a fall protection plan, a risk assessment should be made for the safe use of the AWP equipment to prevent the potential fall hazards described above. A risk assessment will include the following:

- 1 Identify the hazard.
- 2 Assign the risk.
- 3 Define a control measure.



The following chart highlights some examples of potential identified hazards, the assigned risk and the defined control measure. **Note that this is not an all-inclusive list, rather it is a sample assessment of potential risks that should be completed by a competent person.**

Sample Risk Assessment Considerations

Hazard	Risk	Control Measure
Boom lift is struck by another vehicle.	Machine moves unexpectedly, causing ejection.	Restrict the work area around the AWP equipment.
Operator/occupant climbs on the guardrails.	Operator/occupant loses balance and falls.	Train/retrain operator/occupant, improve supervision, raise platform, use more appropriate equipment to properly reach the work area.
Operator/occupant overreaches beyond the edge of the platform.	Operator/occupant loses balance and falls.	Train/retrain operator/occupant, improve supervision, move AWP equipment closer, use more appropriate equipment.
Tree limb falls on the AWP equipment.	Machine moves unexpectedly, causing ejection.	Reposition the AWP equipment.
Driveable boom hits a bump.	Operator/occupant is ejected.	Survey path of travel prior to moving the AWP equipment.
Operator/occupant leaves platform.	Operator/occupant falls.	Train/retrain operator/occupant, improve supervision, use more appropriate equipment for task.

Section X: Implementing a Fall Protection System

Whenever possible, eliminate fall hazards. Identify hazards that can't be eliminated and evaluate each one. The evaluation will assist in determining appropriate PFP for the work site. Review the following questions and items of consideration before implementing a fall protection plan. **This is not an all-inclusive list but a few examples.**

Questions to consider when implementing a fall protection plan:

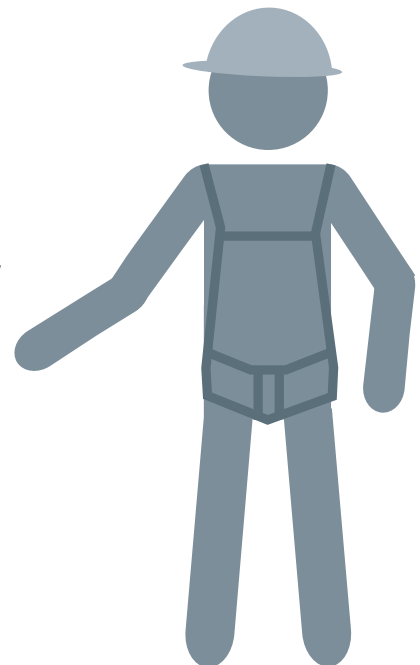
1. What is the fall distance from the working surface to the next lower level?
2. How many operators/occupants are exposed to the hazard?
3. What task and work areas are associated with the hazard?
4. Are proper anchorages available?
5. How will the operator/occupant(s) be promptly rescued if suspended in a personal fall arrest system?
6. Does the AWP equipment operator have someone on the ground to assist in case of an emergency?
7. Is the AWP equipment operator/occupant(s) trained in self-rescue techniques?
8. Are there other rescue plans in place that can be applied in all circumstances?
9. Has the operator/occupant(s) been trained in how to properly inspect and don PFP equipment?
10. Are there changes in the equipment or the work-site conditions that require retraining?



A risk assessment by a competent person should be used to evaluate the PFP needs of the operator(s)/ occupant(s) working in boom-type AWP equipment. The risk assessment should incorporate the issues and topics referred to in this document. **This is not an all-inclusive list but a few examples.**

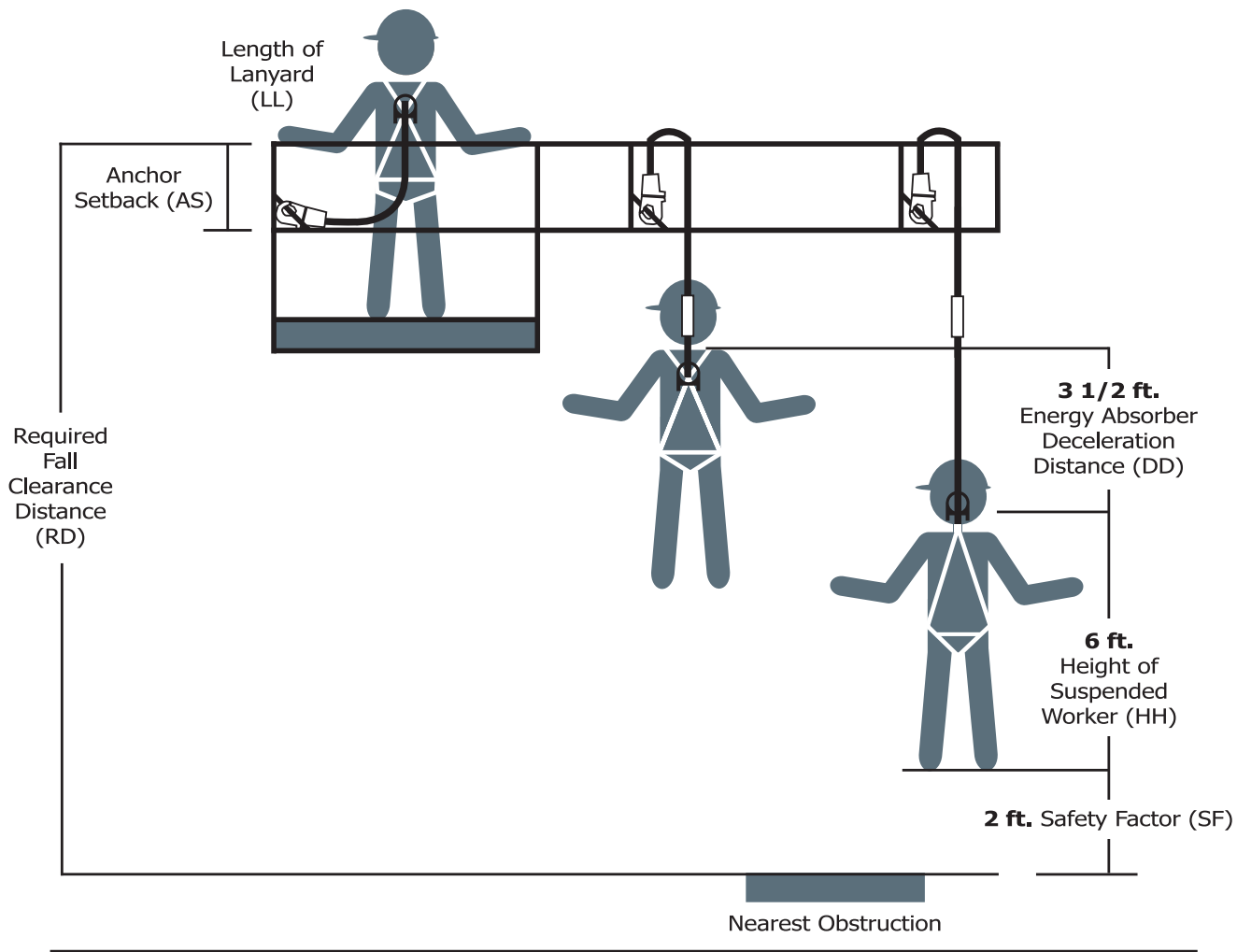
Questions that should be asked regarding fall protection:

1. Did you perform a risk assessment?
2. How do you properly use the PFP equipment?
3. What are the proper methods of inspecting, donning, adjusting and interconnecting the equipment?
4. What are the proper attachment locations?
5. How do you determine free fall distance and total fall distance?
6. What is your rescue plan?
7. What are the AWP equipment manufacturer's and PFP equipment manufacturer's requirements?
8. What is an appropriate anchorage?
9. Did you select and use connectors?
10. Did you properly don and use a full-body harness?
11. Did you correctly attach and use a lanyard?
12. When is a deceleration device necessary?
13. What is the correct procedure for using retractable devices?
14. How do you avoid swing falls?
15. How do you properly inspect and maintain the PFP equipment?
16. Do you know how to properly self-rescue if there is a fall?
17. How do you identify hazards?
18. Do you know the requirements for properly training the operator(s)/ occupant(s) in the use of PFP equipment?
19. Have you been properly trained?
20. Which instructions from the manufacturer are applicable?



Basic Fall Clearance Calculation

(Ideal case shown. Competent person on site should consider other factors, including but not limited to, swing fall, other workers, falls away from anchor, obstructions, etc.)



- | | | | | |
|----|---|-----------------------|---|--|
| LL | = | Lanyard Length | = | Length of lanyard |
| AS | = | Anchor Setback | = | Distance from anchor to the top rail (zero if anchor is the top rail) |
| DD | = | Deceleration Distance | = | Energy (shock) absorber/SRL deceleration distance (typically 3.5 ft.) |
| HH | = | Height | = | Height of suspended worker's D-ring from worker's feet (typically 6 ft.) |
| SF | = | Safety Factor | = | Clearance to obstruction during fall arrest (typically 2 ft.) |
| RD | = | Required Distance | = | Required distance below top of guardrail to nearest obstruction |

RD Using Lanyard	=	[LL - AS] + DD + HH + SF
RD Using SRL	=	2 ft.* + DD + HH + SF

* OSHA requires that all SRLs limit free fall to 2 feet or less. The competent person will need to consider if some or all of the lifeline length that is extracted from the SRL will need to be added to the total fall clearance distance. For example: If a worker falls from a large platform on the opposite side from where he/she is anchored, the extended lifeline may allow that worker to slide back toward the anchor, thereby increasing the required arrest distance.

Section XI: Examples of Do's and Don'ts for AWP Fall Protection

Do:

- Ensure that only properly trained and familiarized personnel are authorized to operate AWP equipment as referenced in the *Statement of Best Practices of General Training and Familiarization for Aerial Work Platform Equipment*.
- Read and understand the manufacturer's instructions for all equipment to be used.
- Choose the correct AWP equipment to reach the work.
- Monitor the operator/occupant(s) performance and supervise the work to ensure the use, application and operation of the AWP equipment is in conformance with the lift manufacturer's operator's manual and all applicable standards, regulations and safety rules.
- Direct and monitor the operator(s)/occupant(s) of AWP equipment to ensure that each person wears PFP equipment when required.
- Ensure that only qualified personnel inspect and maintain PFP equipment.
- Ensure that each operator/occupant is properly trained.
- Immediately remove from service personal fall arrest systems or components subjected to impact loading (e.g., involved in a fall).
- Use PFP equipment only for its intended use.
- Avoid PFP equipment contact with sharp edges. Ensure that all edges that PFP equipment may come in contact with are smooth, rounded or chamfered.
- Ensure that the AWP equipment guardrail system is properly installed and positioned, and access gate(s) and opening(s) closed per the manufacturer's recommendations.
- Operate the AWP equipment safely to avoid the risk of ejection (e.g., drop-offs, being hit by other vehicles or objects).
- Limit travel speed according to conditions.
- Always stand with feet firmly on the floor of AWP equipment.
- Assess each job site for potential fall hazards.
- Ensure that each operator/occupant is wearing the correct size harness.

Do not:

- **Do not** overextend your upper body outside of the basket.
- **Do not** sit or climb on the edge of the basket or use planks, ladders or other devices for a work position.
- **Do not** use guardrails or other AWP equipment components as a PFP system anchorage unless written permission from the AWP manufacturer has been obtained prior to use.
- **Do not** connect to adjacent poles, structures or equipment while working from AWP equipment.
- **Do not** remove the guardrail or leave the gate open during use.
- **Do not** leave an elevated work platform or exit it and remain tied-off unless authorized by the AWP equipment manufacturer and directed by the employer.
- **Do not** exceed the manufacturer's allowed rated horizontal forces when working from the platform of AWP equipment.

For additional information or to comment on this initiative, contact:



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To order or download this document or the *Statement of Best Practices of General Training and Familiarization for Aerial Work Platform Equipment*, contact any of the above organizations.



Resources:
www.OSHA.gov
www.ANSI.org

For more information or to order the following standards, contact:

**ANSI/SIA A92 Standards
or Manuals of Responsibilities:**

Scaffold Industry Association
400 Admiral Blvd.
Kansas City, MO 64106
Phone: 816-595-4860
Fax: 816-472-7765
www.scaffold.org

**ANSI/ASSE Z359
or A10 Standards:**

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Fax: 847-768-3434
www.asae.org