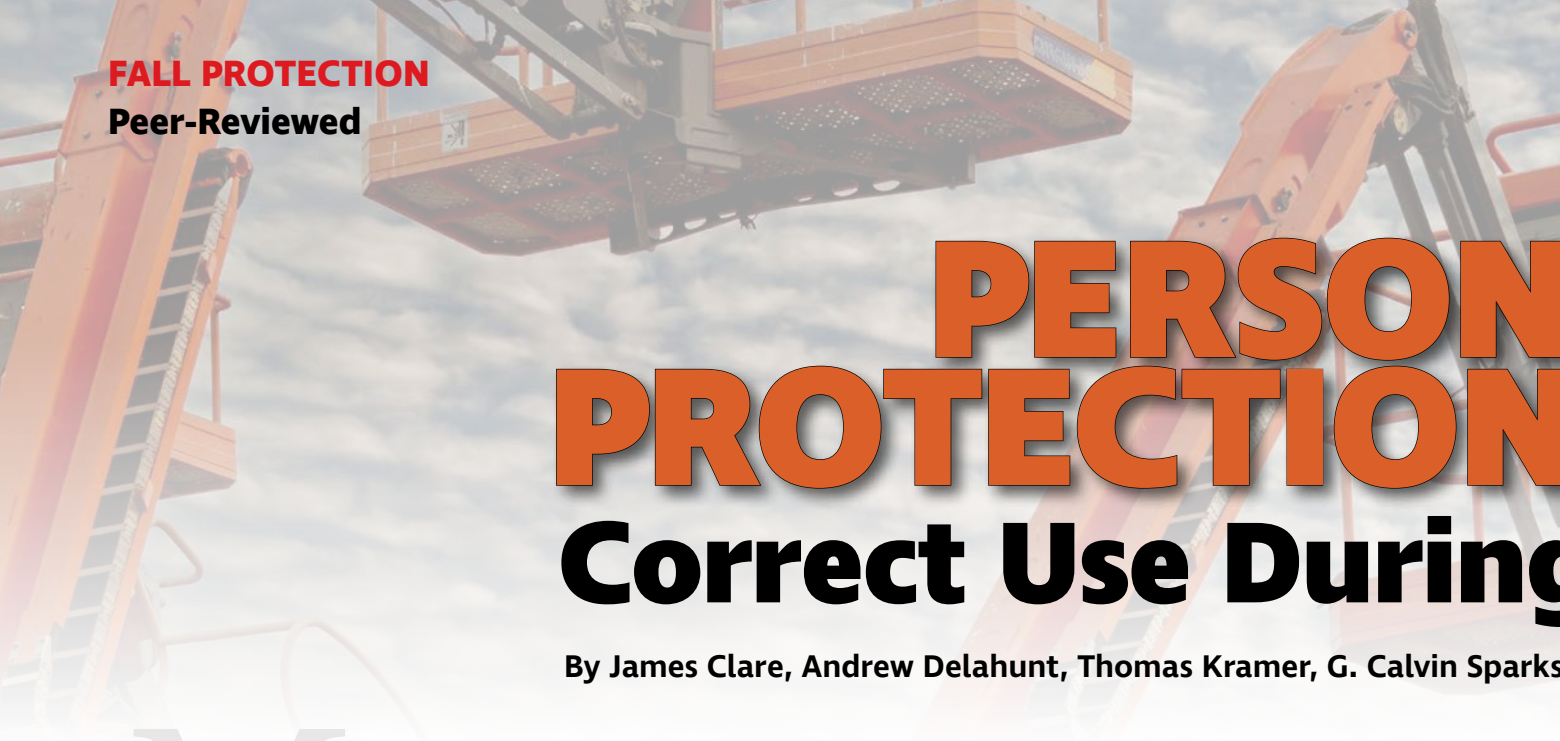

PERSON
PROTECTION
Correct Use During

By James Clare, Andrew Delahunt, Thomas Kramer, G. Calvin Sparks

MOBILE ELEVATING WORK PLATFORMS—more commonly referred to as MEWPs, aerial lifts, scissor lifts or boom lifts—are used by organizations around the world to provide safe access for work at height. In many circumstances, MEWPs are a safer, leaner alternative to ladders and scaffolding. Still, falls and ejections from a MEWP occur too frequently and pose serious risk that all organizations must address. Common types of falls and ejections associated with MEWPs include:

- fall from the MEWP platform when not attached to an anchorage (whether required or not)
- fall from the MEWP platform where the anchorage is inside the MEWP and when using a fall restraint lanyard that is not short enough
- fall from the MEWP platform where the anchorage is outside the MEWP such as an overhead anchorage (Note: This practice is not consistent with federal OSHA regulations.)
- fall while entering or exiting the MEWP platform when elevated (Note: While this is covered in the ANSI/SAIA A92.22-2021 voluntary consensus standard, guidance should come from the manufacturer.)
- fall after exiting the MEWP platform while connected to MEWP anchorage designated for this practice (Note: Due to new requirements in ANSI/SAIA A92.20-2021, this is becoming a more acceptable practice that must be verified with the manufacturer's documentation prior to use. As a comparison, using a MEWP as an overhead anchorage is not a common practice in Europe due to alternative preferred methods or work practices.)
- ejection from the MEWP platform due to being struck by a falling object (e.g., tree branch), vehicle or machine
- ejection from the MEWP platform due to a catapult effect by sudden movement of the boom lift
- fall from a walking/working surface outside of the MEWP when a worker is using an adjacent MEWP as anchorage (This practice initially evolved from vehicle-mounted lift applications.)

KEY TAKEAWAYS

- **An information gap exists about the use of personal fall protection equipment with mobile elevating work platforms (MEWPs), which leads to confusion, misunderstanding and risk.**
- **Planning and a proper risk assessment can help organizations evaluate the best fall prevention and protection methods based on site and MEWP equipment conditions.**
- **Failure to stay within the MEWP platform and keep the guardrails and entry gate fixed in position dramatically increases risk of injury.**

Information Gap

Fortunately, increased usage and awareness have led to industry advances and more information related to both MEWPs and the associated personal fall protection equipment used with them. However, an information gap still exists and creates confusion for many organizations.

While design requirements for MEWPs are found in the ANSI/SAIA A92.20-2021 design/safety standard, guidelines related to equipment and program management are found in ANSI/ASSP Z359 Fall Protection Code standards. Written by different consensus committees, these standards do not overlap and are not congruent, leaving users with an information gap. So, when organizations do not have proper procedures to address the use of personal fall protection equipment in a MEWP, the operator may not have sufficient protection.

An abundance of information exists concerning the need for personal fall protection equipment use while in a MEWP. However, based on the authors' collective experience training thousands of operators over the years, users and operators tend to have one of the four following reactions when asked about this topic:

- They do not know when personal fall protection equipment is to be used.
- They think they know what is correct, but what they are doing creates more risk.
- They admit that they do not know how to properly select and use personal fall protection.
- They are confused and do not know where to get clarity.

What OSHA Regulations & ANSI Standards Say

OSHA regulations for aerial lifts can be found in 1926 Subpart L, Scaffolds, 1926.453(b) Aerial Lifts. Also, OSHA considers scissor lifts to be mobile scaffolds, not aerial lifts, so regulations for that equipment are in OSHA 1926.452(w), Mobile Scaffolds. In 1926 Subpart L, employers must ensure that employees tie off at all times when working from an aerial lift (boom lift) [1926.453(b)(2)(v)]. The ANSI/SAIA A92.22-2020, Standard for the Safe Use of MEWPs, also states that wearing personal fall protection equipment is required when in a boom

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lift (Clause 6.8). ANSI/SAIA A92.20-2020 standard for MEWPs requires manufacturers to provide a single type of anchorage for the connection of personal fall protection devices (Section 4.6.4.1). On the fall protection equipment side, the ANSI/ASSP Z359 standards provide guidance on the use of full-body harnesses (ANSI/ASSP Z359.11), energy-absorbing lanyards (ANSI/ASSP Z359.13) and self-retracting devices (ANSI/ASSP Z359.14).

In short, the regulations only mention the requirement to tie off, and the standards specify that an anchorage is needed and outline requirements for the equipment components. The standards directly require users to develop the complete fall protection system based on the site-specific conditions, and regulations indirectly mention the same. While these references provide helpful information, they are also rather general and do not provide all the details organizations and users need to achieve safe, systematic work plans.

The primary challenge is that none of the documents provide specific guidance on how to use personal fall protection equipment in a MEWP. The lack of complete information means that, despite the plethora of information available, MEWP users need specific guidance on:

- anchorage type: fall arrest or fall restraint
- lanyard type: self-retracting, energy absorbing or non-energy absorbing
- clearances: evaluated based on the anchorage connector location, type and length of lanyard, type of energy management system (e.g., energy absorber)
- connector compatibility: lanyard to anchorage connector on the MEWP

Based on these factors as well as the variety of PPE and types of MEWPs available, there could be many possible combinations, all of which must be evaluated based on the site-specific conditions to determine whether they match the user's needs and are safe.

Fall Arrest or Fall Restraint: Know the Difference

A related device that literally connects the personal fall protection equipment to the MEWP is the anchorage, which could be designated for fall arrest or fall restraint. While ASSP Z359.0-2023 provides a clear definition for the difference between fall arrest and fall restraint, workers often use the anchorage types interchangeably, despite their very different purposes. A fall restraint system limits travel so that an operator is not exposed to a fall from height, while fall arrest systems are intended to stop a free fall.

To provide clarity, a group of MEWP manufacturers created the graphics shown in Figure 1 (p. 28) as examples to be used by MEWP manufacturers for marking anchorage points. The markings are intended to be used next to the anchorage points on MEWPs.

Misuse, such as a fall restraint anchorage used in a fall arrest application, could lead to structural failure of the anchorage or stability issues for the machine. An unintended suspension could result if personal fall protection equipment for a fall restraint system is inadvertently attached to a fall arrest only anchorage. Beyond the challenge of anchorage type, incorporating personal energy absorbers into a personal fall protection system has its complexities.

Due to these information gaps, confusion, misunderstanding and risk remain. Just because a worker is tied off in a boom lift, as OSHA and ANSI require, there are still limitations and restrictions to how the personal fall protection equipment is used and what the worker should or should not do (ANSI/SAIA, 2020; OSHA, 1995, 1998). And injury, including death, could still occur.

Equipment: Past & Present

Many different models of MEWPs are available, ranging from self-propelled boom lifts, scissor lifts, vertical masts, atrium or compact tracked boom lifts, and vehicle-mounted boom lifts. These can be grouped into

USER VS. OPERATOR

User versus operator, as defined by ISO, CSA and ANSI.

User: a person or entity that has care, control and custody of the MEWP

Operator: An entity qualified to control the movement of a MEWP

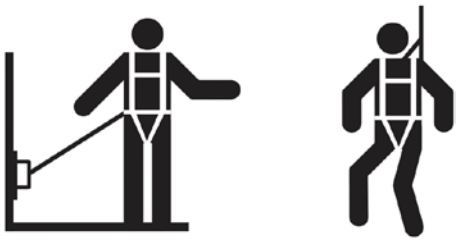
Note: A manufacturer, dealer, owner, user, lessor, lessee or broker is considered to be and assumes the responsibilities of an operator when that entity is acting in the capacity of this definition.

FIGURE 1
ANCHORAGE POINT MARKINGS

Examples of markings that manufacturers place next to anchorage points on MEWPs to indicate the intended purpose of the anchorage point.

This graphic indicates that an anchorage is intended only for a fall restraint system. The anchorage is not permitted to be used with a fall arrest system.

This graphic indicates that an anchorage is intended only for a fall arrest system. The anchorage is not permitted to be used with a fall restraint system.



This graphic indicates that an anchorage can be used for either a fall restraint or a fall arrest system.

This graphic indicates that a fall arrest or fall restraint anchorage is intended for use by one person.

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two distinct classes: Group A, MEWPs with platforms that move vertically but stay inside the tipping lines, and Group B, all other MEWPs, typically boom-type MEWPs where the platform extends past the machine's chassis (Figure 2).

Prior to 1996, many scissor lifts were not manufactured with anchorages. By 2002, most manufacturers added anchorages to scissor lifts, and they were readily available from rental companies. So, if a scissor lift was manufactured before 1996, it may not have an anchorage to use as part of an active fall protection system. Even today, many Group A products are only available with fall restraint anchorages to comply with current American and Canadian standards. Therefore, fall restraint anchorages on these MEWPs are not designed for a fall impact and should not be used with fall arrest systems.

A requirement in the Canadian Standards Association (CSA, 2017) standards and newly introduced in ANSI/SAIA A92.20 is the mandatory fall arrest overturning test for Group B MEWPs, which verifies the stability of the MEWP when a weight is dropped from the platform. Users must confirm whether the anchorages on the MEWP are rated as fall restraint or fall arrest so that they have the proper equipment and work procedures to use the MEWP safely as intended. The rental company or MEWP manufacturer can provide that information, and each user can verify it in the operator's manual.

Fall Protection for MEWPs

On a MEWP, guardrails are the primary fall protection. Therefore, it is critical to stay within the platform and keep the guardrails and entry gate fixed in position. Tying the gate open drastically increases the risk of a fatal incident. Also, climbing onto or over guardrails or exiting at height are other ways a user can bypass the protection provided by the guardrails and increase the risk of an injury.

Occupants can also be ejected from the boom lift platform, resulting in a fall from height if a suitable fall protection system is not used. A high rate of ejections occurs in tree-care operations when falling branches hit the platform or boom structure. Another common cause of ejection is the MEWP being struck by a vehicle, crane or other machinery. This can occur while elevated or when unloading and requires planning to set up the MEWP in an isolated position clear from vehicles and other machinery.

Additionally, the catapult effect can cause occupants to be thrown from the platform. Sudden movement of the boom creates this scenario and is often caused by two situations that are typically addressed during training: first, after the MEWP has been blocked by an object (snagged) and then released; and second, the MEWP is jolted when driving over a curb or pothole or unloading from a truck ramp, causing the boom to whiplash. Due to the configuration of boom lift MEWPs, the catapult risk cannot be eliminated, so it is important for those on boom lifts to always wear a correctly configured harness and lanyard to reduce the severity of an incident.

Regardless of the configuration or personal fall protection equipment used, if a worker is ejected from a MEWP, a significant chance of injury exists. So, if staying in the MEWP is the goal, what is the best way to achieve that?

Is it better to use a lanyard or a retractable? Do you want a fall arrest or restraint system? A proper risk assessment will help evaluate the most appropriate solution based on the site and MEWP equipment conditions.

In the past, the most common solution was to use a 6-ft energy-absorbing lanyard to tie off in a MEWP, but two challenges arose from that application. First, a perception was perpetuated through the industry that if a worker was tied off and fell out of the MEWP, the fall impact would topple the MEWP. Therefore, the fall arrest overturning test is used by MEWP manufacturers to verify that a Group B MEWP will remain stable if a fall occurs. Technical standards do not require this test for Group A MEWPs.

Second, a January 2009 OSHA letter of interpretation led some to believe that a fall clearance distance of 18.5 ft was required when using a MEWP, meaning the fall protection system did not provide adequate protection until the MEWP with worker was 18.5 ft in the air. To address the confusion on this issue, OSHA rescinded the letter in August 2011, stating that compliance with Section 1926.502(d) of Subpart M, which limits free fall to 6 ft, was the intended requirement (OSHA, 2011). As shown in Figure 3 (p. 30), the clearance required is much less than 18.5 ft, and, in some cases, 7 ft may be enough.

Fall Protection Options

An educational document from a group of industry associations outlines four options for a personal fall restraint system or personal fall arrest system (ARA et al., 2011). When considering these options, a critical point is that when the options are used in a fall arrest configuration, a rescue plan must be in place, as well as an assurance that free fall will not exceed 6 ft.

- Fall restraint using a short lanyard: The location of the anchorage point and the height of the occupant are critical in the determination of lanyard length and the overall ability of the system to prevent a fall or ejection.
- Fall restraint or arrest using a lanyard with an adjuster: This option allows the occupant to have either a fall restraint system or a fall arrest system, depending on the adjusted length of the lanyard. One challenge to this option is whether the operator is permitted to manually adjust the lanyard to keep it as short as possible. The work preplanning

FIGURE 2
CLASSES OF MEWPs

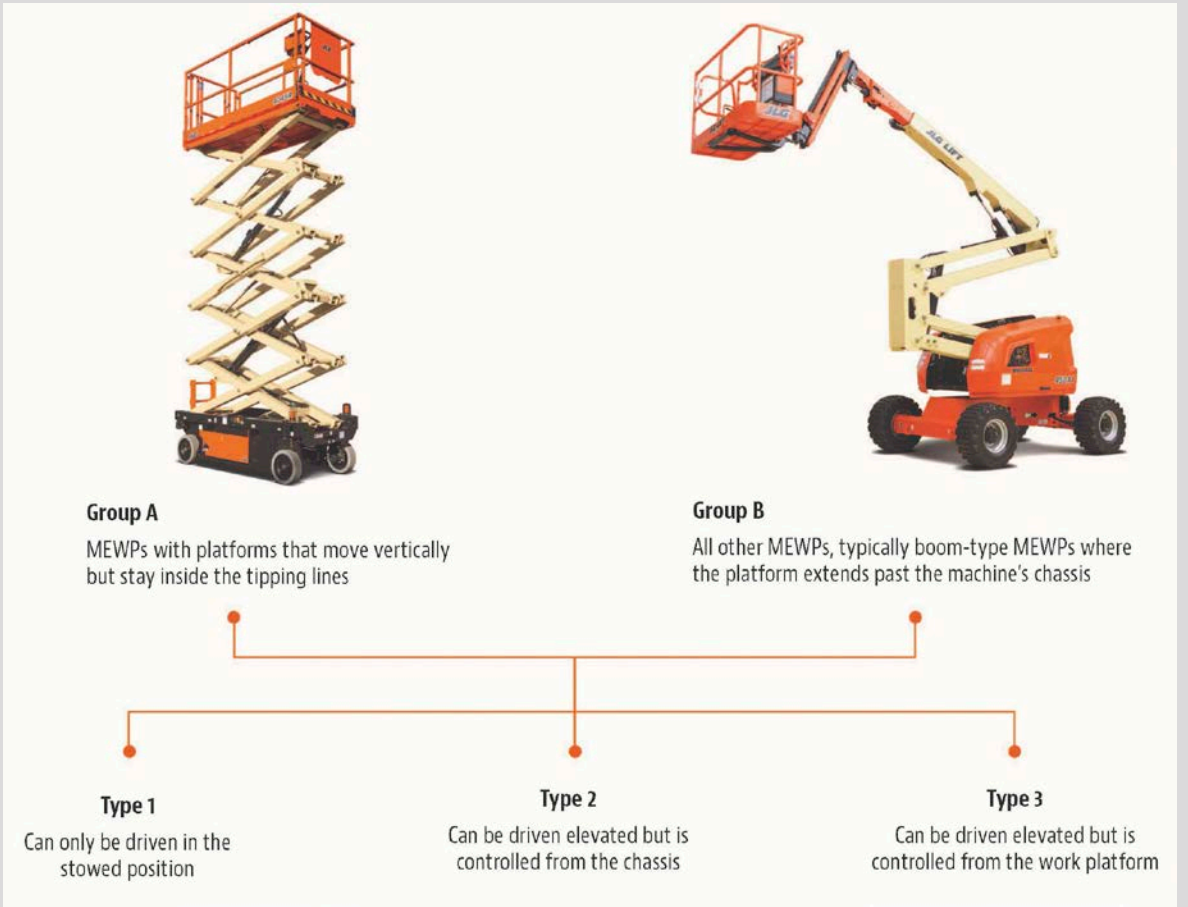

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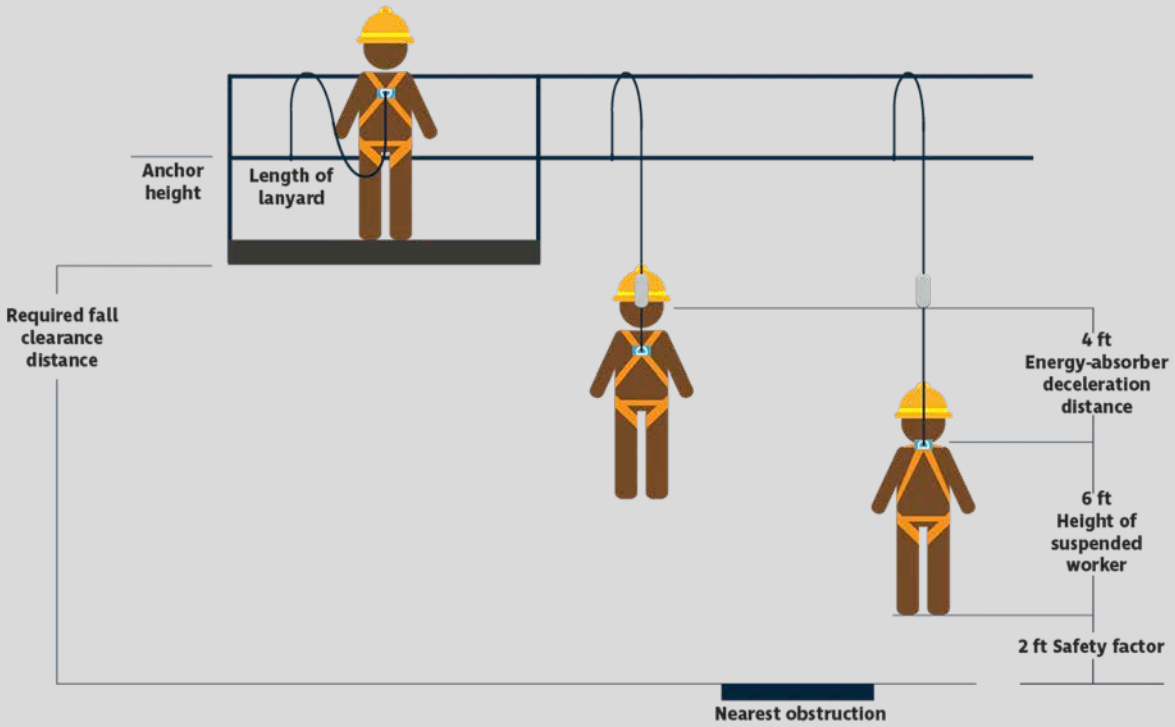
FIGURE 3

CONSIDERATIONS FOR FALL CLEARANCES FROM A MEWP

This figure shows an example case. The competent person on site should consider other factors, such as compatibility with MEWP, total fall distance, free fall, swing fall, other workers, type of device, falls away from anchor, structural edge contact, obstructions and other factors.



Note. Adapted from "Statement of Best Practices of Personal Fall Protection Systems for Aerial Work Platform Equipment," by American Rental Association (ARA), Association of Equipment Manufacturers (AEM), Associated Equipment Distributors (AED), International Powered Access Federation (IPAF) & Scaffold Industry Association (SIA), 2011, https://bit.ly/3JioAbT.

assessment should include examination of what might prompt workers not to make required lanyard adjustments so that risk-reduction countermeasures can be designed and applied to achieve desired performance outcomes. In most cases, the fall restraint system is used while transporting the MEWP from one location to another. On the other hand, the fall arrest system is used after the MEWP is transported to the work location and additional mobility is required while working within the MEWP platform.

- Fall restraint or 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 absorber. The length of the restraint lanyard is determined by the length required to reduce the possibility of the occupant from falling out of the MEWP. The longer leg of the double-legged lanyard is used after the MEWP is transported to the work location and additional mobility is needed. One challenge to consider is whether the operator is trained to understand the proper procedure for using the equipment correctly in each situation. Some organizations may conclude that changing between short and long lanyards could lead to greater risks.
- Fall restraint or arrest using a self-retracting lanyard (SRL): The SRL selected must be one that the SRL manufacturer approves for use with the specific MEWP equipment. Some SRLs are not designed to have the anchorage point below the connection point on the occupant. Also, the SRL should only be used if the personal fall protection equipment manufacturer has tested it to protect the work from the ejection hazard. It is common for MEWP anchorages to be below occupant waist height, which may render the SRL ineffective. Before use, this issue should always be verified with the personal fall protection equipment manufacturer.

The commonly used single-leg, 6-ft energy-absorbing lanyard is not included in this list, as it is not part of the document referenced. While its use is compliant in some situations, the preceding four options are much safer and their use should be prioritized when preparing fall protection use and rescue procedures. The primary situations where a single-leg, 6-ft energy-absorbing lanyard has unacceptable risk include where fall clearances are insufficient, the anchorage is not rated for fall arrest and there is no rescue plan.

Additional Considerations

Several other factors related to equipment must be considered when planning for fall protection equipment use in a MEWP:

•Compatibility between the anchorage connector built into the MEWP and the snap hook is critical, although the chance of failure is reduced with standard size snap hooks having a minimum gate strength of 3,600 lb.

•Use of accessories that allow operators to gain extra working height from the MEWP platform must be avoided. Using a portable step platform or a similar object to gain height beyond what is provided from standing directly on the MEWP platform is prohibited by ANSI/SAIA A92.22.

•MEWPs may have an anchorage system for working outside the platform (Photos 1-4). This anchorage system must be confirmed by the MEWP manufacturer for use as a fall arrest system. According to ANSI/SAIA A92.20, these systems may require stability testing of the machine similar to a dynamic fall arrest anchorage test. Since workers are exposed to higher risks when outside the platform, a specific risk assessment and documented work method are required. When used correctly, an external anchorage system may present lower risk than if the worker were connected to an external structure or using leading-edge fall protection equipment.

Selection of Suitable Fall Protection

One caution to consider when selecting personal fall protection equipment is whether it has been tested for the particular application. Specific considerations include the locking mechanism and energy management devices of self-retracting devices, as well as the likelihood of the line making contact with an edge. If a personal fall protection equipment manufacturer cannot confirm that the piece has been tested in a MEWP application, consider how to ensure that it will perform for your personnel. During a risk assessment, it is critical to consider whether sharp guardrail edges and other platform edges could be a hazard for cutting any part of the device. Also, technologies from third-party suppliers are emerging to improve operator behavior, such as interlocks to restrict MEWP use until the lanyard is connected to the anchorage point. These types of modifications should also be addressed with the original MEWP equipment manufacturers before implementation.

Finally, always be sure that the personal fall protection equipment used meets the latest ANSI/ASSP Z359 standards when purchased, as the Z359 Fall Protection Code is continually being updated to address new products and methods of use in the field. If you are supervising work at height, do you know the right equipment, both personal fall protection and MEWP, to use?

Resources & Recommendations

Fortunately, to help organizations understand this complex issue, various industry associations have developed effective educational materials. In particular, the International Powered Access Federation has created many videos and educational campaigns that address issues such as working near roads, common hazards and MEWP equipment tips. Additionally, Stachowiak (2020) discusses fall protection when working with MEWPs.

Ultimately, the various industry groups need to hear from users and operators—people who work in and with MEWPs every day—to understand how the existing information, guidelines and MEWP equipment contribute to their ability to work safely. Also, users and buyers can work with industry experts to facilitate the appropriate testing to ensure that the personal fall protection equipment is tested in accordance with the MEWP application. While this might not be easy to accomplish, ignorance from any side is not an excuse for placing workers at risk.

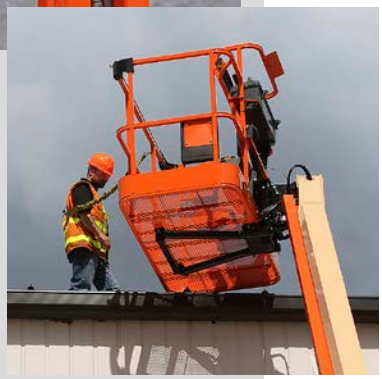


Photo 1 (above): An anchorage subsystem that allows for limited excursions outside of the MEWP, if jobsite or local restrictions allow. Photo 2 (right): The pictured external fall arrest anchorage subsystem allows one worker limited excursions outside the MEWP, if the jobsite and local restrictions allow. Specific guidelines for use and inspections are in the operator's manual and must be followed.

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Photos 3 and 4 (above, right): The pictured aircraft external fall arrest anchorage subsystem allows one worker limited excursions outside of the MEWP, if the jobsite and local restrictions allow. Specific guidelines for use and inspections are in the operator's manual and must be followed.

Workers make choices every day that affect their safety. But employers provide the workplace, plans, training and tools that each worker uses as part of their work process, so the blame cannot be placed on workers when there is confusion and conflicting information about the safe application of fall protection for MEWPs. The operator must have the right information to choose the appropriate personal fall protection equipment. And the worksite must be safe to work at height, which means completing a risk assessment prior to work commencing, selecting the correct MEWP and compatible equipment, managing traffic to prevent collisions from vehicles or machines, training drivers to unload the MEWPs, and providing supervision and training for the user or operator to use safe practices. **PSJ**

> Ultimately, the various industry groups need to hear from users and operators—people who work in and with MEWPs every day—to understand how the existing information, guidelines and MEWP equipment contribute to their ability to work safely.

References

American Rental Association (ARA), Association of Equipment Manufacturers (AEM), Associated Equipment Distributors (AED), International Powered Access Federation (IPAF) & Scaffold Industry Association (SIA). (2011). Statement of best practices of personal fall protection systems for aerial work platform equipment (02-11-AWP-SBP002). https://bit.ly/3JioAbT

ANSI/ASSP. (2017). Minimum requirements for a comprehensive managed fall protection program (ANSI/ASSP Z359.2-2017).

ANSI/ASSP. (2020). The fall protection code (ANSI/ASSP Z359.1-2020).

ANSI/SAIA. (2020a). Design, calculations, safety requirements and test methods for mobile elevating work platforms (MEWPs; ANSI/SAIA A92.20-2020).

ANSI/SAIA. (2020b). Safe use of mobile elevating work platforms (MEWPs; ANSI/SAIA A92.22-2020). https://webstore.ansi.org/standards/sia/ansisaiaa92222020

ASSP. (2023). Z359 committee guidance document for definitions and nomenclature used in Z359 fall protection and fall restraint standards (ASSP Z359.0-2023).

Canadian Standards Association (CSA). (2017). Mobile elevating working platforms—Safety principles, inspection, maintenance and operations (CSA B354.1:17). www.csagroup.org/store/product/B354.7-B354.8_pkg

International Powered Access Federation (IPAF). (2022, March 10). Don't fall for it. www.ipaf.org/en/resource-library/dont-fall-it

International Standards Organization (ISO). (2014). Mobile elevating work platforms: Safety principles, inspection, maintenance and operation (ISO 18893:2014). www.iso.org/standard/59976.html

ISO/DIS. (2014). Mobile elevating work platforms: Design, calculations, safety requirements and test methods (ISO/DIS 16368). www.iso.org/standard/83151.html

OSHA. (1995). Aerial lifts [CFR 1926.453 (Subpart L)]. www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.453

OSHA. (1998). Fall protection systems criteria and practices [CFR 1926.502 (Subpart M)]. www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.502

OSHA. (2011, Aug. 22). Standard interpretation: Fall protection on aerial lifts during construction operations. www.osha.gov/laws-regs/standardinterpretations/2011-08-22

Stachowiak, J. (2020). Debunking fall protection myths. *Rental Management*, 6-7. https://xdigital.spiweb.com/publication/?i=656181

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