

# Proper Use of Industrial Scissors Lifts As Personnel Work Platforms

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## **BACKGROUND**

There is an increasing demand by companies to improve manufacturing flexibility and throughput by providing personnel variable height access to their work. This is especially true when the work being accessed is raised off the floor and outside an operator's normal ergonomic power zone. Or, the work may be large, heavy, or restricted in its ability to be moved between work stations in a manufacturing process. In either case, it is much more economical to bring the worker to the work rather than bringing the work to the worker. Industrial scissors lifts have been used to position material, tools, equipment and/or personnel in such applications for over 50 years. ANSI MH29.1 – *Safety Requirements for Industrial Scissors Lifts* is clear about this and cites the minimum safety precautions that must be taken to protect riders who operate the lift from the top of the lift's moving platform.

## **DEFINING A "WORK PLATFORM"**

Industrial scissors lifts used to provide workers with variable height access to their work are often called "personnel work platforms", "scissors work platforms", and "work access lifts", among other names. According to ANSI MH29.1, a work access lift is defined as meaning: "A stationary, portable or mobile scissors lift operated from the platform which may include other riders; the lift may be used to transfer material from one elevation to another." Or put another way, scissors work platforms are variable-elevation working and walking surfaces supported by an industrial scissors lift which provides personnel adjustable-height access to their work. The scissors lift may be mobile or fixed in its position.

## **A TALE OF TWO CODES**

A distinction must be made, however, between industrial work platform lifts as covered by ANSI MH29.1 and aerial work platform lifts covered by ANSI A92. Both manually propelled (A92.3) and self-propelled (A92.6) aerial scissors platforms are recognized by the standards community as being different from industrial scissors lifts, and subsequently fall under a completely different equipment safety code for several reasons:

1. Unlike aerial lifts, industrial scissors lifts do not have the potential to be rented, leased, or operated by the general public.
2. Unlike aerial lifts, scissors lifts which are moved from one location to another with a rider on the lift are not "steerable" (unrestricted movement) from the lift – but rather are restricted to a pre-determined path via tracks, rails, grooves, etc..
3. Unlike aerial lifts, industrial scissors lifts which do have unrestricted (steerable) lateral movement are not allowed to have riders during that lateral movement, but can only be accessed by riders once the lift is made stationary.
4. ANSI MH29.1 recognizes that mobile aerial lifts are used for different applications than industrial scissors lifts and specifically excludes equipment designed to meet ANSI A92 from the scope of MH29.1.

## **PROTECTING THE OPERATOR / RIDERS**

Whenever scissor lifts are accessed by riders, it is critical to provide all the necessary means of protecting these personnel from accidentally falling off of the elevated working/walking surface of the lift platform. The two most appropriate safety codes to be referenced when establishing minimum levels/means of personnel protection are MH29.1 – *Safety Requirements for Industrial Scissors lifts*, and OSHA 29CFR1910 – *Occupational Safety and Health Standards for General Industry*. In the event that neither of these nationally recognized safety standards specifically address the personnel protection requirements for a unique operating environment or application, it is incumbent upon the manufacturer to voluntarily comply with applicable portions of related equipment codes and/or the application of industry best practices. The following represents the most common of these personnel protection requirements – both mandatory and voluntary.

### **OSHA-Compliant Handrail System**

Mandated by ANSI MH29.1, a guardrail system must be installed around the perimeter of the elevated working surface whenever the elevation of that platform reaches 48” or more as measured from grade level, and guards both the operating (accessed) and non-operating (non-accessed) sides of the lift platform. Permanent guardrail requirements and material design are based primarily on the standards set forth in OSHA 29CFR1910.23, and include requirements for: 1) minimum top rail height (39”), 2) a mid-rail, 3) a bottom “kick plate” (4”H), and 4) a minimum load/strength requirement of the top rail only (200 lbs. applied in any direction) that must be withstood without showing signs of permanent deformation. Protection across accessed openings along the platform perimeter must be provided using temporary guarding such as personnel restraint chains or removable/hinged handrails. Temporary or removable protection must meet the same height and strength requirements as permanent guardrails (except for resisting loads applied in the upward direction).

### **Maintained Contact Operator Pushbutton Station**

The latest version of ANSI MH29.1 mandates that any industrial scissor lift that is accessed by riders must be controlled by maintained contact (press and hold) operator controls only. This design requirement allows the operator on the elevated working platform to be in complete control of the movement of the lift, thereby minimizing accidents that could result from unexpected and/or unanticipated movement of the working/walking surface. Further design requirements related to controls are that they must be clearly marked as to their direction and function, be protected from inadvertent operation, and be readily accessed by the operator.

### **Non-Skid Walking Surface**

Though there is no mandate found in ANSI MH29.1 concerning the design of the walking surface, best industry practices suggest that the imposition of a requirement in this matter is appropriate. OSHA 29CFR1910.24 does require that all stair treads be “reasonably slip-resistant”, and related standard ANSI A92.6.4.13 requires that the platform walking area have “a slip resistant surface.” So, based on these published industry best practices, as well as the experience of responding to many company-specific equipment specifications that require non-slip walking surfaces – especially when the operating environment involves the possibility of wet or slippery floor conditions – adherence to a self-imposed design requirement in this regard is recommended. Typical methodologies used to satisfy this requirement are by using tread-plate construction, or by applying a slip-resistant paint finish.

**Lift Fall Arrest System**

ANSI MH29.1 requires that all industrial scissors lifts be designed with a means to control the down speed of the lift in the unlikely event that the electrical power (for mechanical actuators) or hydraulic pressure (for hydraulic actuators) were suddenly and unexpectedly cut off due to a severed electrical or hydraulic supply line. The code specifically requires that when in this type of “fault condition”, the descent of the lift be “promptly arrested” or the “rate of descent of the lift will be limited to a speed not to exceed the greater of 4 times the normal down speed or 30 feet per minute when fully loaded”. Arresting the descent of the lift is made possible by including an emergency device/system which senses an over-speed condition – typically a flow-measuring device such as a hydraulic velocity fuse – and then introduces a physical blockage to prevent further downward movement of the lift.

**Personnel Access Gates**

Personnel access gates are a popular means of protecting temporary openings in the perimeter of the work platform at the points where operators/riders enter and exit the lift. There are no requirements stated in ANSI MH29.1 specific to the use or design of personnel access gates – other than those already stated above concerning height and strength requirements. However, best practices can be found in OSHA 29CFR1910.66 as it pertains to the design of powered platforms and manlifts that carry passengers. Two such best practices as it relates to access gates are that these hinged gates be 1) self-closing, and 2) be self-latching, or provided with locks that prevent them from being opened inadvertently when the lift is in an elevated position. Beyond this, it is generally good practice to sense the position of these self-closing gates via an electrical sensor such as a limit switch or proximity switch which is placed and adjusted such that the lift cannot be operated unless all access gates are in the fully closed position.

**Emergency / Manual Lowering Valve**

Again, neither ANSI MH29.1 or OSHA 29CFR1910 specifically address or require the use of a redundant means to lower the working platform from an elevated position in the event of a power outage or other failure of the primary lowering valve. Best industry practice suggests that a requirement be borrowed from the related equipment standards of ANSI A92.6 in this matter. The requirements of A92.6.4.7 state that any aerial work platform that is elevated via a powered means shall be supplied with a “clearly marked emergency lowering means readily accessible from ground level.” Practically speaking for most hydraulic lifts powered by an electric or air motor, this requirement is satisfied by plumbing a manual block valve and fixed flow control valve into a secondary lowering circuit near the base of the lift to be readily accessible to ground personnel and – when opened – allow oil to flow back to the reservoir in a controlled manner.

**OSHA-Compliant Personal Fall Arrest System**

Though not specifically addressed or mandated by ANSI MH29.1, a generally accepted, industry good practice is that any time an operator will be working across a temporarily unprotected/unguarded side of a work platform that is open to a vertical drop of more than 60”, that worker should be equipped with a personal fall arrest system that – as defined by OSHA – consists of: 1) anchorage, 2) connectors, 3) body belt or body harness, and 4) lanyard or life line – or some suitable combination of these. Particular design and testing requirements are too exhaustive to mention here and can be obtained from OSHA 29CFR1910.66 as the application dictates.

### **Emergency Means of Egress**

The need to provide a means of emergency egress other than that provided by use of a manual lowering valve (discussed above) is typically not required for scissors-style work access lifts, due in large part to the generally low vertical distances travelled by these lifts. Emergency egress is not a requirement of ANSI MH29.1, nor is it mentioned by other related equipment standards outside the context of lowering valves. In general, however, compliance with a job-specific requirement for emergency egress can be accomplished using a variety of designs such as rope ladders, telescoping aluminum ladders, or folding stairs that store on the lift platform and can be accessed by employees if needed.

### **GUARDING THE LIFT OPERATING ZONE**

Equally important as protecting the operators and riders on the platform of a work access lift is the guarding of personnel (and property) within the immediate vicinity – or operating zone – of that lift. Continuing to reference ANSI MH29.1, OSHA 29CFR1910, and other generally accepted good industry practices, it is the responsibility of the end user to inform the manufacturer as to the likelihood of the work platform lift experiencing any potential interference with, or influence by, bystanders, passers-by, surrounding building structure, adjacent equipment, and/or the part/work being accessed. The following represents the most common of the design features that can be incorporated to minimize inadvertent contact with people and objects in the vicinity of an operating lift.

### **Lift-In-Motion Audible/Visual Alarm**

This feature is a very cost-effective method of warning personnel within the lift operating zone that the lift is moving, or about to move (vertically and/or laterally). Most employees that have worked within an industrial environment are accustomed to the audible alarms of moving equipment such as fork trucks, automatically guided vehicles (AGVs), and overhead cranes. These simple warning devices can be attached to the moving equipment or fixed to the building in the area of the lift, can be provided with fixed or adjustable volumes, and are available with and without visual warnings such as flashing or rotating lights.

### **Safety Enclosure System (fixed/permanent lifts only)**

ANSI MH29.1 mandates that any industrial scissors lift whose vertical travel creates a distance of 60” or greater as measured between the surrounding floor/grade and the underside of the work platform/carriage assembly is required to be supplied with a means of preventing personnel in the lift operating zone from being beneath the lift when the operator initiates downward movement of the lift. The code calls for one of the following approved methods of guarding: 1) enclosure panels (on non-operating sides) that are a minimum of 8 feet high, 2) landing gates with interlocks (on operating sides) also 8 feet high, or 3) rigid straight skirts that travel below grade & attached to the lift platform.

### **Flexible Protective Skirting**

Flexible – often “accordion” or “bellows” style – vinyl skirting that completely surrounds the scissors mechanism. The skirting is hung from the underside of the work platform and expands and contracts automatically with the rising & lowering of the scissors lift. This style of skirting is very common because it: 1) inhibits the collection of debris beneath the scissors (permanent installations), 2) serves as a barrier to prevent inadvertent contact between personnel, clothing, etc. and the moving scissors, and 3) provides a visual indicator of lift movement (most skirts are safety yellow).

### **Shear Point Protection**

ANSI MH29.1 mandates that any industrial scissors lift which travels adjacent to and past a fixed landing while it is being lowered must be provided with an approved means of protecting the edge of the platform from creating a shear point between the moving platform and the fixed landing. According to MH29.1, there are five (5) approved design approaches to guard against shear: 1) beveled toe guard, 2) straight rigid skirts, 3) toe indicator bar, 4) electric sensing edge, and 5) above-ground enclosure system. Determining which design is best depends on the application and the restrictions at the installation site.

### **Handrail Filler Material**

Occasionally there are applications where it may be more critical to protect the people on the floor level from objects accidentally falling from a raised work platform – due to the number of people working on or near the lift, the number and types of hand tools being used, and/or the aggressive nature of the overhead work being performed (pounding, riveting, etc.). To help create a more effective barrier between the workers overhead and the workers on the floor, handrail openings (between top rail & mid-rail, and between mid-rail and toe plate) around the perimeter of the lift can be filled with material such as expanded metal, sheet metal, Lexan, or Plexiglass.

### **Interference Detection**

Interference detection can be an important consideration when a moving lift has a high potential of making physical contact either with nearby personnel, or with adjacent equipment or parts. In either case, sensors can be installed on or near the leading edges of the lift that are most likely to make contact with people/parts and to stop lift movement (lateral and/or vertical) once a nearby object is detected. Sensors come in two basic styles: contact (lever arm switches, reversing sensing edges, etc) and non-contact (proximity switches, laser sensors, etc.) and are available in a variety of mounting styles, sensitivities, IP ratings, etc.

## **IMPROVING WORK ACCESS & OPERATOR EFFICIENCY**

Over and above the mandatory and/or voluntary personnel protection and guarding features mentioned so far, there are additional design features which can be incorporated into work platform lifts to greatly improve the workers access to the parts being worked on, as well as features to generally improve worker productivity and efficiency. None of these features are mandated by equipment safety codes, but they are recommended for consideration as potential productivity improvements and ways to increase overall throughput of a manufacturing process. In no particular order of importance, these optional features are:

### **Lift Mobility – Manual or Powered**

One of the most common design features of personnel work platforms used to increase worker productivity and/or manufacturing flexibility is to provide the lift with a means of mobility. Attaching wheels or casters (manual or powered) to the base frame of the lift allows: 1) the operator to achieve optimum positioning of the lift relative to the work being accessed, 2) the lift to access all points along a large part being accessed – without the need for an excessively long work platform, and 3) the lift to be moved between work stations and used by multiple operators for multiple operations and applications.

Additional design considerations must be made whenever providing a work platform lift with mobility: 1) providing adequate load stability through braking once the lift is brought to its intended position via foot-actuated wheel locks or floor locks (for manual mobility) or motor brakes (for powered mobility), 2) ensuring adequate lift stability (anti-tipping) due to the presence of high edge-loading via use of wide scissors stances, platform counterweights, 3) providing floor rails or other means of wheel guidance - in the event that a rider will be on the lift in a raised position during transit, and 4) providing interference protection or detection on the leading edges of the mobile lift base and/or platform (see Interference Detection above for more information).

### **Shuttling / Sliding Platform Extensions**

Personnel work platform applications often involve a part being accessed that is not uniform in its shape or distance from the worker. Or, due to space restrictions, the work platform lift cannot be parked/placed immediately adjacent to the work at floor level, but at some elevation above the floor this restriction is no longer an issue and improved operator access can be gained if additional horizontal/lateral movement of the work platform surface only (not the scissors frame) was possible. In both these cases, the solution to providing the operators a means to laterally adjust the location of the work platform walking surface is to design the platform with the ability to extend, slide, or shuttle over the edge of the scissors leg assembly – either manually or via powered actuators.

Additional design considerations must be made whenever providing the ability to laterally shuttle or extend the operator walking surface out over the edge of the scissors lift: 1) providing effective personnel fall protection for the temporarily extended working surface by using adjustable chains or telescoping handrails, 2) providing a “home position” sensing switch to ensure that the extending or telescoping deck surface is retracted prior to allowing any vertical lift movement – to prevent unexpected contact with people or property beneath the extended deck, 3) providing a stable scissors leg assembly that is designed to resist twisting and deflection under these off-centered loading conditions, and 4) providing interference protection or detection on the leading edge of the shuttling platform deck (see Interference Detection above for more information).

### **On-Board Utilities**

Many applications require the operator/riders on the lift to use computers (for inventory control, data entry, etc), hand tools (electric and/or pneumatic), weight scales, or other devices that necessitate the immediate availability to shop utilities such as compressed air and/or 115VAC electrical power. It is very common in these instances to provide utility boxes on the work platform with the air and/or electrical power required, which can be easily accessed by the workers via quick disconnect fittings or electrical outlets/plugs.

### **On-Board Lifting Devices**

In those applications where manual material handling of objects weighing 40 pounds or more is taking place on the work platform surface, it is not uncommon to provide operators with material handling equipment mounted onto the work platform surface to safely and ergonomically handle these objects. The most common material handling equipment includes industrial lift tables, industrial tilters, and overhead hoists.

### **Adjustable Handrail Systems**

In addition to the telescoping (horizontally adjustable) handrail design that is used for improved fall protection with shuttling/sliding platforms as mentioned above, there are also applications in which a vertically adjustable handrail design is required to temporarily avoid interference with immovable structures or components attached to, or adjacent to, the part being worked on. These adjustable designs typically include one or more sections of handrail which can be manually folded, hinged, or telescoped out of the path of obstructions as required to temporarily allow the lift additional travel or movement to provide improved accessibility to the part for on-board personnel.

### **“Belly Bar” Handrail Systems**

This type of handrail system refers to a configuration of fixed handrails that are placed on the operating sides of work platforms. These handrails are designed with an outward slant of 20-30 degrees on the upper half of the handrail section to more comfortably accommodate an operator that is required to reach out over the edge of the platform to access his work, and regularly leans on the top rail as a means to maintain balance and support while reaching. In these applications, the top rail height is usually limited to the minimum required by OSHA – 39”. Anything lower could promote falling over the top of the bar, anything higher restricts the movement and reach of the employee.

## **SUMMARY ON WORK PLATFORM/ACCESS LIFTS**

Regardless of how they are named, scissors lifts used as personnel work platform lifts are a longstanding and popular method of increasing worker productivity and safety, and of improving manufacturing flexibility and throughput. Through infinitely variable adjustment in both vertical and lateral directions, workers are given a stable and ergonomically appropriate working/walking surface to more effectively access their work. Being careful to stay within the parameters/restrictions given by ANSI MH29.1 for industrial scissors tables used as a “work access lift”, and by using the applicable equipment safety requirements of OSHA 29CFR1910, there are otherwise no limits to how these lifts can be customized to fit any particular work access application.