

RiskTopics

Ladder safety on construction sites

Zurich Resilience Solutions - Risk Engineering

Ladders are tools that are used regularly on construction sites. Most ladder accidents are preventable with proper planning, design and training.

Introduction

According to the Occupational Safety and Health Administration (OSHA), falls from portable ladders are one of the leading causes of occupational fatalities and injuries. Slip/trip falls at the same level often account for one of the highest percentages of fall related accidents. However, falls from height usually involve greater injuries. Ladders are involved in most of these falls from height type accidents. In some cases, the accident is caused by using another object, like a chair or cart in place of a ladder.

Discussion

Improper use of a ladder is often the cause of ladder injuries. According to the Center for Disease Control (CDC) and the National Institute for Occupational Safety and Health (NIOSH), there are five major causes for ladder fall incidents¹:

- Incorrect extension ladder setup angle — In approximately 40% of cases, the leading cause of ladder-related injuries is a ladder sliding out at the base due to an incorrect setup angle. Ladder users tend to set extension ladders at shallower angles than the optimal desired angle (75 degrees).
- Inappropriate ladder selection — Selection of a ladder with the proper duty-rating is also important to avoid structural failure. However, many ladder users lack knowledge of proper ladder selection.
- Insufficient ladder inspection — You can reduce the likelihood of ladder structural failure by practicing regular inspection and maintenance.
- Improper ladder use — Activities such as overreaching, carrying objects, applying excessive force, slips, and missteps are also frequent causes of ladder-related fall injuries.
- Lack of access to ladder safety tools and information — Small companies that account for up to 80% of all construction companies, and individual ladder users, such as homeowners, do not typically receive the required training for safe use of portable ladders. Such ladder users are difficult to reach, often do not have access to safety information, and generally lack the resources to develop or follow an effective ladder safety program

Guidance

Ladder safety training should be a part of any safety and fall protection program. Ladder safety training should cover four basic topics: selection, inspection, set-up and climbing. See [Appendix A](#) for some common ladder safety rules.

Proper Handling and Set-up

This sounds like a very basic topic, but in some service industries, most of the accidents are caused by handling heavy ladders, not falling from them. A 28' extension ladder can weigh over 70lbs and is 15' long in the storage position. Taking a ladder that size on and off the ladder rack ten times a day can be problematic. There are ladder racks available that move the ladder down into a more ergonomic position. Using an articulating ladder might eliminate the need for a ladder rack altogether.

When setting up the ladder, make sure you are on firm level ground. Never level a ladder using brick or boards. Instead of building up the low side, you should dig out the high side. There are after-market leg levelers available from several companies and manufactures have added leveling devices to some models. When setting up an extension ladder make sure it is at the proper 75.5-degree angle. This can be calculated by moving the base of the ladder one foot away from the wall for every four feet that the ladder goes up. Easier than doing the math problem, just use the firefighter method. Put your toes at the feet of the ladder and hold your arms out and rest the palms of your hand on the rung at shoulder height. This is a quick and easy ways to set your ladder up at the proper angle. NIOSH has a free Ladder Safety App that includes an angle measuring tool.

Selecting the right ladder for the job

The first rule of selecting the right ladder is to use a ladder that is designed for the task. Never use chairs or buckets, etc. to work at height.

Proper ladder selection should consider:

- Weight rating - Ladders are rated at 200lbs, 225lbs, 250lbs, 300lbs and 375lbs. In calculating the weight rating needed, you should add the weight of the user with all their clothing and gear plus the weight of any tools or equipment they might be carrying. Ladders are often used by everybody on the jobsite, so plan for the biggest user.
- Material – Never use a metal (aluminum) ladder when working on or near electricity. Fiberglass ladders have aluminum rungs and spreaders, but the side rails are made of a non-conductive material and will insulate the user. Remember, ladders are communal and will be used by other people on the jobsite. They might be working on electricity even if you're not. You might still have a wood ladder that is in good condition. Wood ladders are considered non-conductive, but wood absorbs moisture and wet wood will conduct electricity, so inspect thoroughly.
- Style – Step ladders (A-frames) should be used in the open position, never closed, and leaned against a wall. This has changed in the last few years because manufactures have designed new models that are made specifically to be used in this position. This does not mean all the old A-frames can be used this way, only the new ones that have been designed to lean. When working on stairs or un-even surfaces use an articulating or multi-purpose ladder that can adjust to those un-even surfaces.
- Length – This is more complicated than it sounds. A 20' ladder is not 20' long. Ladders have always been sold by the total length of the sections, so a 20' is two 10' sections. You can't use those sections end to end, they have three feet of over-lap, so your 20' ladder is only 17' long. You should never stand on the top three rungs of an extension ladder and if you are climbing onto a roof there should be three feet of ladder above the roofline. Step ladders (A-frames) are listed by their height, so a 6' step ladder is 6' tall. You should never stand on or use the top cap or top step of an A-frame ladder, so a 6' ladder should only get you 4' off the ground.

Inspection

Ladders are built with a 4 to 1 safety ratio, so if your ladder is rated at 250lbs., it is tested at 1,000lbs. A ladder in new condition will never be the cause of an accident if used properly. A damaged ladder however could easily cause an accident. If your ladder is bent, broken, cracked or split, then you have no idea what weight that ladder will hold. So, what are the things you should be looking for in a ladder inspection?

- Feet - the feet on your ladder are like the tires on your vehicle. They are made of a soft rubber, so they will grip the ground, which is good. But soft rubber wears out and becomes slick, which is bad. If the tread is worn on your ladder feet, they need to be replaced. If your company uses a lot of ladders, it's a good idea to

have replacement feet on hand.

- Side Rails - if the side rails are cracked, bent, or split the ladder needs to be replaced. There is no glue or duct tape that will repair broken fiberglass. A commonly asked question about fiberglass is, is the ladder bad if the fiberglass is faded. Fiberglass breaks down in UV radiation, sunlight and will fade faster if stored on the top of the ladder rack or the sunny side of the building. Fading does not mean the ladder is bad but excessive fading will cause the surface to split or crack.
- Rungs and Steps - again, if they are bent or broken, they are bad and need to be replaced. Also, make sure they are free from any dirt, grease, or oil.
- Latches, locks, rivets, bolts, and ropes - Over time, all the connection points become loose and worn. Make sure that these connections are tight, and the ladder doesn't walk. Latches should move freely, and the springs should be in good condition.
- Stickers - should be legible and in good condition. This is easier said than done. Warning labels are on the outside of the rail and are often worn off, faded, or gone. In the past, replacement labels have been hard to get because ladder companies didn't know what condition the ladder was in that you wanted to put new labels on. This is changing, and companies are now selling replacement label kits on their websites.

Climb safe

Always face the ladder when climbing and maintain three points of contact. If you are working from a ladder, maintain balance and control by leaning into the ladder with your hip or torso. Some companies have very specific rules about three points of contact so you might need to have fall protection like a harness or a guardrail. The most important rule in ladder safety is to keep your body between the side rails. Never overreach, climb down, move the ladder over and climb back up. Almost all the disabling or fatal accidents from ladders are caused because someone overreached to get that one last thing.

Conclusion

Most all ladder related incidents are preventable. There are many resources available that can be used for toolbox talks, ladder safety training per OSHA in 1926.1060 and 1910.23, safety stand downs and group discussions. An effective ladder safety program should include safety procedures, training on those safety procedures, inspection that the procedures are being followed, and disciplinary action when they are not. Also consider a Job Safety Analysis to ensure the proper ladder is provided.

For more information on Zurich's extensive Risk Engineering and Sustainability services, please contact your Risk Engineer or visit us at [Risk Engineering and Sustainability Services | Zurich Insurance \(zurichna.com\)](https://www.zurichna.com).

References

¹ "CDC - Falls in the Workplace: NIOSH Ladder Safety Mobile Application - NIOSH Workplace Safety and Health Topic." Centers for Disease Control and Prevention, Centers for Disease Control and Prevention, www.cdc.gov/niosh/topics/falls/mobileapp.html. <https://www.cdc.gov/niosh/topics/falls/mobileapp.html>

² Common Ladder Safety Rules. www.ghba.org/wp-content/uploads/Ladder-Safety-Month-2017-780x1024.jpg.

"American Ladder Institute." Ladders 101 - American Ladder Institute, www.americanladderinstitute.org/.

"UNITED STATES DEPARTMENT OF LABOR." Occupational Safety and Health Administration, www.osha.gov/.

Other resources

American Ladder Institute (ALI)

ALI has resources on their website including standards, free training, checklists, and posters. Their website can be accessed via the following link:

[American Ladder Institute](http://www.americanladderinstitute.org/)

To reduce the numbers of accidents and injuries involving ladders, the ALI promotes Ladder Safety Month every March. National Ladder Safety Month will bring heightened awareness to the importance of the safe use of ladders through resources, training, and a national dialogue. To get involved, access their materials at the following link: [National Ladder Safety Month](https://www.nationalladdersafetymonth.org/)

NIOSH

NIOSH has a free Ladder Safety App that includes ladder safety tools for ladder selection, inspection, set up, proper use and accessories. To learn more about falls in the workplace, visit:

[Falls in the Workplace: Ladder Safety Mobile App | NIOSH | CDC](#)

OSHA

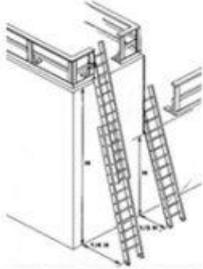
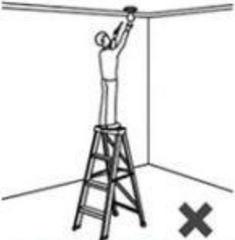
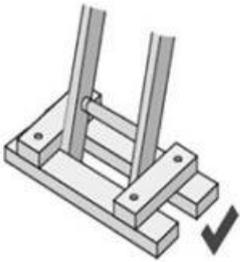
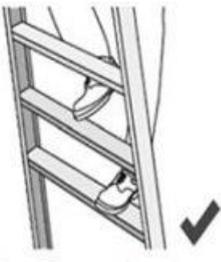
Ladder Safety eTool:

[eTool : Construction - Falls - Ladder Safety | Occupational Safety and Health Administration \(osha.gov\)](#)

Appendices

Appendix A – Common ladder safety rules²

Common Ladder Safety Rules

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|  <p>Maintain a 4:1 Ratio</p> |  <p>Don't Carry Tools and Equipment While Climbing</p> |  <p>Maintain 3 Points of Contact</p> |
|  <p>Don't Use the top Step of the Ladder</p> |  <p>Prevent Passersby From Going under the Ladder</p> |  <p>Don't Use Damaged Ladders. Inspect for Damage</p> |
|  <p>Secure the Base of the Ladder</p> |  <p>Don't Place on Uneven Unstable Ground</p> |  <p>Wear Proper Footwear</p> |
|  <p>Don't Use Near Doorways. Lock the Door if Necessary. Beware locking exit routes!</p> |  <p>Secure the Top of the Ladder</p> |  <p>Don't Lean Away from the Ladder. Stay Centered Between the Rails</p> |

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