Fall Prevention vs. Fall Protection: A New Safety Category

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Introduction

It’s better to put a fence at the top of a cliff than to park an ambulance at the bottom. Instead of catching the climber after the fall, let’s design the product to prevent the fall from occurring. Stop climbing Grandpas ladder and lets improve ladder safety through better design.

Even with a renewed emphasis on ladder safety training the numbers of ladder related injuries continues to rise. In 2008, the CPSC estimated that more than 500,000 people were injured while using a ladder or stepstool. In 2010, the estimate rose to 724,000—that’s nearly 2,000 people injured every day. Experts estimate that 100 people will suffer a long-term or permanent disability each day. And 1 person will die, every day.

As I travel around the country speaking about ladder safety I have the opportunity to meet with groups from different industries and talk about their ladder problems. Some industries face very unique challenges but most are very similar. Ladder accidents occur because of complacency. People have been climbing ladders since they were little children on the playground and they don't consider ladders as safety equipment. Another common complaint is that several ladder related rules are almost impossible to keep and get the work done so it becomes accepted to break the rule. How do you tie off a ladder before you climb it? How to maintain three points of contact while getting the work done? Some of these concerns can be addressed through training but some need innovation and design changes.

Training

Safety professionals need to know there are great training resources available. The American Ladder Institute (ALI) has developed the best online ladder safety training available at www.laddersafetytraining.org. The free site provides a pre-test, an informative training video, a post-test, and a printed certificate of completion. The site also allows safety managers load groups of employees and tracks the training of their employees. Also, in my role as national safety director at Little Giant Ladder Systems, I travel to organizations and jobsites all over the country performing live ladder safety training events at no charge. The resources are out there; you just have to know where to look.
Training Topics

Proper training should cover four main areas; selection, inspection, setup and climbing. Selection can also be divided into four categories.

Weight rating - make sure that the weight rating of the ladder is greater than your weight and the weight of any tools or materials you will be carrying. I have people ask me "if I weigh 170 pounds, why can't I use a type III 200lbs rated ladder". Well, 200lbs rated ladders are classified as homeowner ladders and your using it on the job. Ladders aren't classified as industrial until you get to type 1 250lbs rating. Another reason is that ladders have a tendency to be borrowed by whoever needs one at the moment. His name is Bubba and he doesn't weigh 170, I think it's a southern rule that you can't be called Bubba unless you're close to 300.

Material - Most job sites require fiberglass ladders because they are non-conductive. Again, people ask, "if I'm not working around any electricity, why can't I use an aluminum ladder. And again the answer is, that ladder is going to disappear the minute you turn around and the next guy might be working on the lights. Best practice is to just have fiberglass on the job.

Length or height - the shortest ladder is also the lightest and often that the one the person would rather carry. Unfortunately they rarely come back for the right size ladder; instead they try and make the short ladder work by climbing on the top step or top cap. You should always make sure the ladder is long enough to safely reach the work without climbing on the top rung or top cap of a stepladder or the top three rungs of an extension ladder.

Style - You should use the correct style of ladder for the job (stepladder, extension, staircase) you should never lean a stepladder against a wall and climb it like an extension ladder. And if you need to work in a staircase, do not get creative just get an articulating or multi-purpose ladder that will adjust to the stairs.

Ladders should be inspected at three different times. First, when you receive it to make sure it is in good condition and has no freight damage. Second, every time you use it. And third, on a regular or periodic basis by a competent ladder inspector. Someone who by either training or experience, knows what to look for and has authority to do something about it if they find a problem. This should be a more detailed inspection than the before every use inspection. Both however should focus on a few key areas:

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 then 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.

Now that you have picked the right ladder for the job and inspected it, it's time to set it up. Surprisingly, a high percentage of ladder injuries are from handling and set up. Ladders are heavy and awkward because of their size. Always use caution when removing a ladder from a ladder rack. Find the balance point and carry the ladder with the front slightly elevated. When setting up, always look up first; know what is above you. Set up on a flat, dry spot. Stake off and tie off whenever possible. Never set up in front of a door that opens outward unless the door is blocked off. If you have to set up near a corner or blind spot, make sure that the area is properly marked with cones or tape. You don't want someone driving around the corner to take the ladder out from underneath you. Extension ladders should be set up at 75.5 degrees or a 4 to 1 ratio. For every 4 feet the ladder goes up, it should come out from the wall 1 foot. When climbing on to a roof or raised platform, the ladder should be three feet above the roofline. Never level the ladder by shimming with bricks or boards. The correct way to level a ladder is to dig out the high side instead of building up the low side. This can also be accomplished with leg levelers that can be added to the sides of the ladder.

Climbing - 3 point rule - when climbing a ladder always maintain three points of contact. Never climb a ladder while carrying tools or equipment. Use a rope to raise and lower tools after you have climbed to the desired height.

"Lashing" - if one ladder is good then two is not better. Lashing is when two ladders are tied together to reach greater heights and should never be done!

Belt buckle rule - Never overextend - always keep the center of your body (belt buckle) between the side rails of the ladder. Never over reach, if you can't safely reach something, climb down, move the ladder and re-climb.

Always climb facing the ladder, wear proper footwear and make sure all spreader bars and latches are fully locked.

One thing I have learned though, is that training alone is not enough. We need to stop climbing Grandpa’s ladder, both figuratively and in some cases literally. Think about it, there are not many products that you use today that are the same design as when your Grandpa was using it.

Ladders haven't changed much in hundreds of years. Sure, the materials have changed from wood to aluminum to fiberglass but the design has remained the same. One of the problems with ordinary
ladders is that they were not tested to bear up under actual use—meaning they aren’t designed to be used the way people actually use them. Ladders are tested on a flat floor in an ANSI-compliant testing lab with static dead weight. If you used your ladder the way it was tested you would probably be fired—because you wouldn’t be getting anything done.

### Hierarchy of Control

When designing a product or process it is best to design out all dangers. This is outlined in the hierarchies of control. Simply put, engineer the danger out, if that is not possible guard against the danger, if you are unable to adequately guard then warn, train and provide PPE. Unfortunately long ago someone decided that ladder couldn't be improved so they just put a lot of warning labels on them and had countless training meetings where we tell people not to do the things we know they do. Everything else has improved with technology; I think it's time we started improving ladders.

### Understanding the Causes

Understanding how people use ladders and more importantly how they get injured using ladders is key to designing new safer climbing products. Studying the statistics, we can divide ladder accidents into three categories.

First, strains and sprains from unloading, carrying and setting up the ladder. Almost half of the reported injuries involving ladders are caused by the awkward size and weight of the ladder. The easy solution to this problem is to make it lighter.

Second, using the wrong type or size of ladder for the job. A lot of times this is caused by the first problem. The right size ladder is too heavy so we grab the smaller one and try to make it work by climbing to high on the ladder.

Third, falls from height due to overreaching or improper setup. All three are painful and costly but a higher percentage of disabilities and fatalities come from catastrophic falls from height, so let's concentrate on that.

"I was just trying to reach that last thing" is the start to a lot of really bad ladder accident stories. We are trained to keep our bodies between the side rails to prevent us from overreaching. However we know this doesn't always happen. Too often, we stretch to reach that one last thing instead of climbing down and moving the ladder. No matter how much we train people—it’s human nature. Understanding that this is a recurring problem we can design around it. Again, "Stop using Grandpa's ladder."

Another factor in side tip accidents is how level the ground is in the set up. When working outside the ground is almost never level. It's not even level inside a lot of times. To give you an idea of how much level ground can affect tipping, if a 28' extension ladder is 1 inch off at the base the top of the ladder will be 19 inches off. That puts the top of the ladder completely out of the footprint of the ladder. Even if you are keeping your body between the side rails your ladder will tip. When asked what they do when the ground is not level most people will say that they use a brick or a board to build up the low side of the ladder. Spending time on a scavenger hunt looking for the right sized board to level your ladder
doesn't sound very productive or safe. OSHA recommends that you dig out the right side of the ladder instead of building up the low side. This is rarely done because it is very time consuming. After market leg levelers can be added to the base of you ladder but they have two major problems. First, they add extra weight to an already heavy ladder (remember problem number one) and second, they do not any extra stability to the ladder.

If you think about all the equipment on a job site, if it needs to be stabilized the manufacture adds outriggers.

**Safety by Design**

By adding outriggers to an extension ladder, we can increase the side-tip stability by over 500 percent. Because level ground is such a big factor in most side-tip accidents, designing the outriggers to also level will also greatly reduce the possibility of a tip due to overreaching. Stop using Grandpa's ladder.

Extension ladders with outriggers are safer than straight ladders, safer products by design. Another design to help reduce tips on extension ladders is by locking the top of the ladder in place with a self-locking attachment at the top of the ladder. These are three innovative tools that will increase stability on an extension ladder and reduce injuries, but what about a stepladder?

Stepladders have different problems to overcome. People still tip over because of overreaching, but you also need to solve the three-points-of-contact issue and any tie-off rules that might apply. And you also need to work on uneven surfaces or staircases.

You should always maintain three points of contact when ascending and descending a ladder (two feet, one hand or two hands, one foot) but what do you do when you have stopped climbing and start working? Most safety people say you should still maintain three points of contact. Most workers will say it's hard to get the job done using just one hand. The OSHA standard does not include portable ladders in the 6' tie off requirements but that has not stopped a lot of companies from including it into their best practices. In fact some companies require tie off from above when as low as 4' off the ground. These rules are meant to protect the user but are very difficult to follow and some times impossible.

Because of these difficulties some general contractors have imposed restrictions on using ladders on their job sites. They require their sub contractors to find different ways to get the jobs done. We agree, you should stop using Grandpa's ladder and find a safer way.

By combining the platform and handrail system of an enclosed scaffold system with an adjustable fiberglass stepladder, you can solve all of these issues. These new aerial safety cages or adjustable enclosed platforms have recently hit the market. While working in the caged platform you do not need to maintain three points of contact, and you can work freely with both hands. The 42" handrail system on the aerial safety cages remove the need to tie off from above, allowing operators to get the job done quickly and safely, even when there is nothing to tie off to. The adjustable base would also allow it to work safely on uneven ground and stairs.

Now that these designs are a reality and being widely accepted in industry, we hope that all ladder manufacturers will stop building Grandpa's ladder and start designing ladders built for how people really use them.