How Power Plants are Reducing Work-Related Injuries

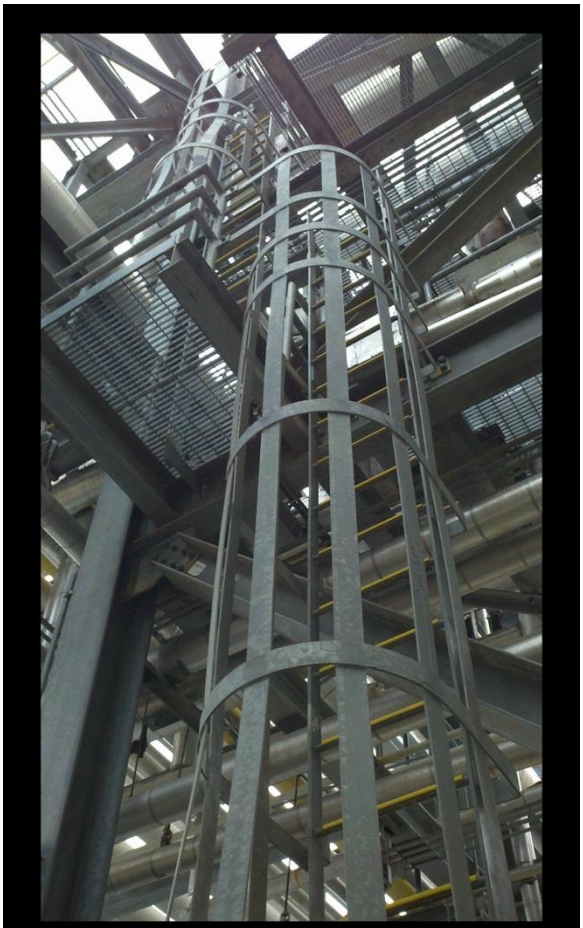
Addressing Falls through Preventive Anti-Slip Measures

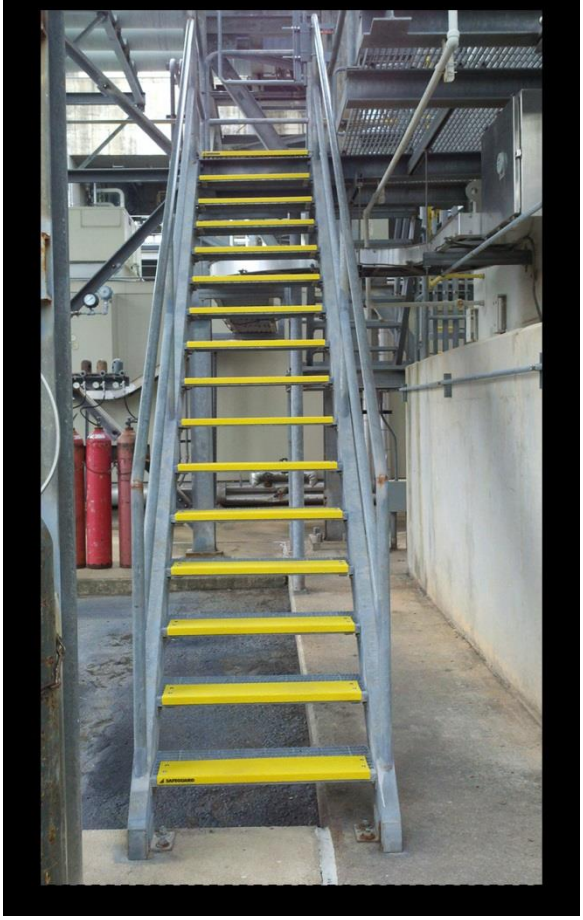
Safeguard Technology, Inc.
1460 Miller Parkway
Streetsboro OH 44241
800-989-1695 | 330-995-5200
www.safeguard-technology.com
info@safeguard-technology.com

SAFEGUARD TECHNOLOGY
Leading Manufacturer of Anti-Slip Safety Products

Table of Contents

How Power Plants are Reducing Work-Related Injuries





If you've had a near-miss or an actual slip-and-fall incident, you're aware of the pain it brought about, literal and figurative. Hopefully, no serious injuries were sustained. Still, the resulting paperwork, insurance claims, investigations, and legal issues are better avoided. Slips-and-falls are preventable. Anti-Slip solutions are plentiful; here we will walk you through the dangers posed to power plants and how to select the proper anti-slip solution for your area.

According to the US Occupational Safety and Health Administration (OSHA), the five most common hazards associated with worker injuries in the electric power industry are:[1]

1. Electrocution
2. Falls
3. Confined Spaces
4. Fires and Explosions
5. Sprains, Strains, and Fractures

Falls from heights

We will start by looking at hazard number 2. When a power plant employee must work on a ladder, scaffolding, or catwalk, a fall can cause devastating injuries — traumatic brain injury, back and spinal injuries, paralysis, and internal organ damage are common.

Because of the potential for such serious consequences, falls from elevation have been the subject of numerous studies in an effort to reduce these incidents. One such study, by the US Centers for Disease Control (CDC) Worker Deaths by Falls, cites slipping on rungs

and steps as factors that contribute to falls from ladders. The report provides recommendations such as designed-in or retrofit slip-resistant rungs and steps to reduce the risk of fatal falls.

Another source of relevant recommendations is found in OSHA Standards for Fixed Ladders 1926.1053(a)(6)(i) which states that the rungs and steps of fixed metal ladders manufactured after March 15, 1991 shall be corrugated, knurled, dimpled, coated with skid-resistant material or otherwise treated to minimize slipping.

Additionally, 1926.1053(a)(6)(ii) states that the rungs and steps of portable metal ladders shall be corrugated, knurled, dimpled, coated with skid-resistant material or otherwise treated to minimize slipping.

It is important to recognize that corrugated, knurled, or dimpled metal ladder rungs can lose anti-slip properties when exposed to frequent traffic as the metal ridges meant to grip footwear simply wear down and become smooth. Inspection of current conditions is required and may reveal a need for a retrofit anti-slip cover.

Falls on the same level

Falls on the same level are a frequent cause of sprains, strains, and fractures (number 5 on the list of common injuries in the power industry). These are commonly known as slip-and-fall incidents. Although generally less serious, these incidents are more frequent and so have a high number of recordable cases.

OSHA standard 29 CFR 1910.269 addresses Occupational Safety and Health Standards in the power distribution industry, including walking and working surfaces, requiring that sprayers and related equipment must be covered with slip-resistant material.

More general OSHA requirements also apply, as in Standard 1910.22 Walking-Working Surfaces (Final Rule) which took effect in 2017. A walking-working surface is any horizontal or vertical surface on or through which an employee walks, works, or gains access to a work area. The rules apply to walking-working surfaces in all general industry workplaces. Requirements here include:

- Employees must have a safe way to access and exit all walking-working surfaces.
- Walking-working surfaces must be inspected regularly and kept in a safe condition.

Costs of slips-and-fall accidents

Costs of slips-and-fall accidents are high and most reports cite only direct costs. The US CDC provides a calculator at https://wisqars.cdc.gov where the costs of various types of injuries can be estimated. This method places the average cost of a non-fatal fall at $38,925 (see image below).

Hospitalizations and Type of Cost			Intent
			Unintentional
Mechanism			
Fall	Number Hospitalized	----	$992,452
	Medical Cost	Average	$38,925

However, this only reflects the average direct medical expense which is just a portion of the total costs. Increased insurance premiums and the cost of legal liability - such as defending against lawsuits - can compound the cost. Additional indirect costs to businesses include training replacement employees, accident investigation, implementation of corrective measures, lost productivity, repairs to damaged equipment and property, and costs associated with lower employee morale and absenteeism[2].

Seriousness and Frequency of Injuries in Power Plants

Power plants are not immune to worker injury. According to the US Bureau of Labor Statistics (BLS), the number of fatalities has risen since 2014 and the number of recordable injuries and illnesses were two per hundred workers in 2017[3].

Utilities Work-Related Fatalities, Injuries, and Illness

Data series	2014	2015	2016	2017
Fatalities				
Number of Fatalities	33	39	47	47

Blank cells indicate no data reported or data that do not meet publication criteria.

Data series	2017
Rate of injury and illness cases per 100 full-time workers	
Total recordable cases	2.0
Cases involving days away from work, job restriction, or transfer	1.1
Cases involving days away from work	0.7
Cases involving days of job transfer or restriction	0.4

Blank cells indicate no data reported or data that do not meet publication criteria.

Reducing Slips and Falls, Step by Step

Step 1: The first step in reducing risk in your power plant is to recognize hazards. Inspect the walking and working spaces in your workplace for the presence of contaminants that can contribute to slips-and-falls: Water, debris, oil or other fluids, dust, ice, and snow.

Another hazard to look for is worn anti-slip tape or other measures. As these age, they can lift up off of the substrate, becoming trip hazards.

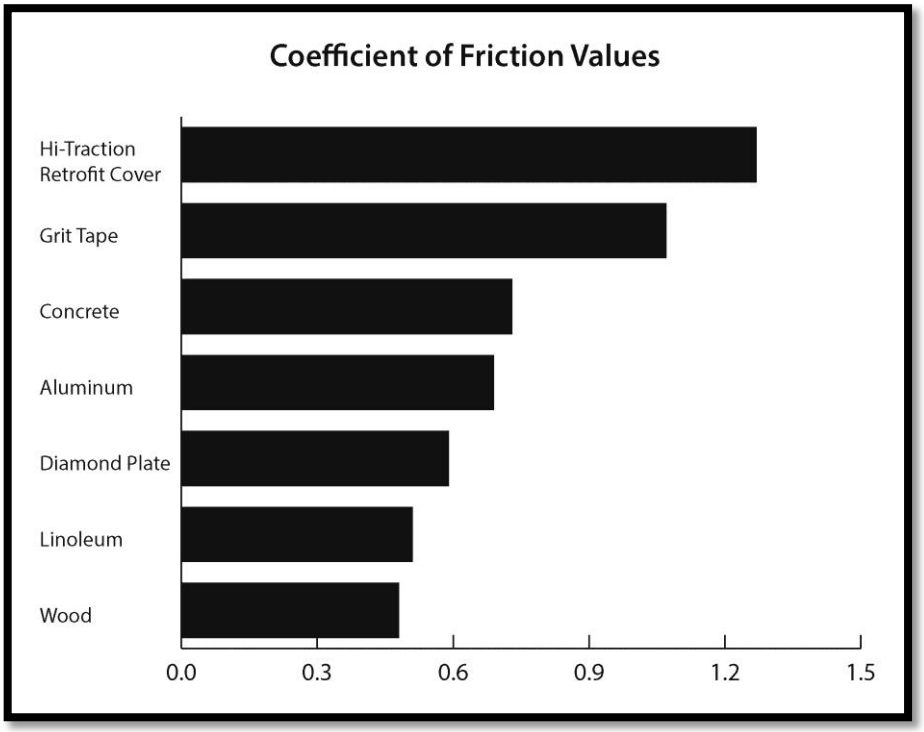
As you start to weigh some possible solutions, consider what base materials are appropriate for the conditions. The presence of moisture can corrode underlying structures, leading to a weakening of the structural integrity of the substrate, especially ladders.

Step 2: Think about the type of traffic in the area as well as the frequency of access. What type of footwear is being worn in the area? Is vehicle traffic present or are wheeled carts used? Is there any carryover of contaminants from surrounding areas?

Step 3: Examine the condition of the flooring in the area. While some paints and tapes can provide temporary protection from shallow cracks or pitted surfaces, any deep gaps will need to be repaired to provide a solid foundation for the anti-slip grit. Anti-Slip covers made of steel or heavy-duty aluminum may suffice to provide a sturdy structure for steps.

Coefficient of Friction

Retrofit anti-slip products generally add traction to slick steps, floors, or ladder rungs by introducing a gritted surface to grip footwear. This adhesion can be measured for comparison, and standards have evolved to protect workers from false claims regarding anti-slip properties. Coefficient of Friction (COF), a measure of the friction between two objects, can be used to indicate anti-slip effectiveness. A COF of 0.5 is a standard guideline for slip resistance under ideal conditions. However, inclined surfaces such as ramps, and wet or oily environments require materials with higher COF values (typically 0.8 and above) to provide adequate protection.



Coefficient of friction values for some common working and walking surfaces show the advantage of anti-slip measures. The COF value is usually between 0 and 1 but can be greater than 1. A value of 0 means that there is no friction at all between the objects (not realistic). A value of 1 means the frictional force is equal to the normal force. It may seem odd that the coefficient of friction can be more than 1, but a value higher than one simply means that the friction is stronger than the normal force. [4]

Durability of Products

Grit can consist of silica (sand), quartz, glass, or aluminum oxide/fused alumina. It is important to understand the material makeup of the grit used in any anti-slip measures you implement as this will determine how long the solution will remain effective at stopping slips before it needs replacement. Harder surfaces last longer and may be needed in heavy traffic and in extreme conditions where contaminants are present. Solutions with low durability for the environment are not only costly in labor required for replacement but also may become a trip hazard as they loosen from the substrate.

Mohs Scale of Mineral Hardness [5]

Substance or Mineral	Hardness
Diamond	10
Aluminum Oxide /Fused Alumina	9
Quartz/Silica/Sand	6
Glass	5
Steel	4

OEM anti-slip solutions such as grip strut may be effective when newly installed, but steel has a low hardness level and will wear down under use. The rugged edges become smooth and lose their ability to stop any sliding action of footwear.

Decision Guide

Consider what types of solutions may be appropriate to mitigate the hazards found in Step 1.

An environment with a high concentration of contaminants such as liquids or dirt will require deeper pockets of space on the surface of the anti-slip grit. Shallow pockets will quickly fill with fluids or dirt, effectively reducing its anti-slip properties.

Small grit for low contaminant level

Medium grit for medium contaminant level

Large grit for high contaminant level

Some common surfaces are compared below to help inform your decision to address hazards found in your environment. These specifics are typical but can vary in different situations.

Comparison Chart

Working/Walking Surface	COF - dry	COF - wet	Durability	Ease of Installation	Range of Options	Downtime for Install	Initial Cost
Anti-Slip Covers	★★★	★★★	★★★	★★	★★★	🕘	$$$
Grit Tape	★★★	★★★	★	★★	★★	🕘	$
Anti-Slip Paint	★★★	★★★	★	★	★★	🕘🕘🕘	$$
Gritted Mats	★★★	★★★	★★	★★★	★	🕘	$$
Non-Gritted Mats	★★	★	★★	★★★	★★	🕘	$
Vinyl Covers	★★	★	★★	★★	★★	🕘	$$$
Diamond Plate	★★	★	★★★	★	★	🕘	$

Conclusion

Addressing slip-and-fall issues before they happen significantly reduces costs to power plants. Medical costs, insurance costs, and potential liability costs are all reduced or eliminated. Implementation of anti-slip solutions can be planned and budgeted while a costly incident will be a direct hit to the bottom line. Additionally, a commitment to employee safety has been shown to boost morale and increase productivity. A relatively small investment in the right anti-slip solution can pay large dividends for the power generation industry. An experienced professional can help you evaluate your situation and select the best anti-slip solution.

1 https://www.osha.gov/SLTC/powergeneration/industry_hazards.html

2 https://www.osha.gov/dcsp/products/topics/businesscase/costs.html

3 https://www.bls.gov/iag/tgs/iag22.htm

4 https://www.sciencedirect.com/topics/chemistry/friction-coefficient

5 https://en.wikipedia.org/wiki/Mohs_scale_of_mineral_hardness