

On the Prevention of Serious Injuries and Fatalities

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Introduction

On January 4th, 2012, the American Society of Safety Engineers' (ASSE) President Terrie Norris, issued a call to action. "A statistical plateau of worker fatalities is not an achievement," she said. "But evidence that this nation's effort to protect workers is stalled. These statistics call for nothing less than a new paradigm in the way this nation protects workers."¹

The pattern the ASSE president identifies goes beyond fatalities to include serious injuries. In the past five years, worker fatalities are level or increasing year to year, and so too are serious injuries.²

Serious injuries are life-threatening (such as significant loss of blood, trauma to vital organs, and damage to the brain or spinal cord), or life-altering (resulting in permanent or long-term impairment of loss of an internal organ, body function, or body part).³

This disturbing trend is found at the national, industry, and organizational level. It has galvanized organizations with OSHA recordable injury and illness rates that are already low, very low in some cases. Seven global companies supported by Mercer ORC Networks and BST pooled their data to study this trend, identify its sources, and recommend strategies to prevent serious injuries and fatalities (SIF).

¹ "ASSE President Continues Call for Action As Society Moves Into Its Next 100 Years, Reviews Challenges Ahead;" posted in American Society of Safety Engineers' Newsroom home on Wed., Jan 4, 2012; http://www.asse.org/en/index.php/press_releases/asse-president-continues-call-for-action-as-society-moves-into-its-next-100-years-into-its-next-100-years-challenges-ahead/

² U.S. Bureau of Statistics, Census of Fatal Occupational Injuries, 2003-2010; <http://data.bls.gov/timeseries/FIU00X00000080N00>
U.S. Bureau of Statistic, Cases Involving Days Away from Work, 2003-2010; <http://data.bls.gov/timeseries/IU0000000063100>

³ "Research on the Prevention of Serious Injuries and Fatalities," 2012, Thomas R. Krause, Ph.D.

This plateau or pattern must not be ignored. The implications are stark. Existing safety systems are not reducing SIF events. As Steve Newell, a consultant with Mercer ORC Networks, said, “No matter how low its OSHA recordable rate, no organization can define itself ‘best in class’ or ‘world class’ if it continues to experience SIFs.”⁴

Reducing Minor Injuries is Not Predictive of Reducing SIFs

The Mercer ORC Networks/BST study group (ExxonMobil, Potash Corp., Shell, BHP Billiton, Cargill, Archer Daniels Midland Company, and Maersk) found that “pillars” of the safety profession may actually form barriers to SIF prevention.⁵ H.W. Heinrich’s eighty-year-old safety triangle is not predictive, for example. Not all injuries have SIF potential. Reducing injuries at the bottom of the triangle (minor injuries) does not assure a reduction of SIFs at the top of the triangle.

A 2007 Rand study stated that there appears to be no relationship between OSHA injury rates and fatalities. The absence of minor injuries is not predictive of an absence of future fatalities. The presence of minor injuries is not an indicator of fatalities in the future.

In 2011, the Mercer ORC Networks/BST study group released findings showing the causes and correlations of SIFs are usually different than those of less-serious injuries, and the potential for SIF events is low for about 80 percent of non-SIF injuries. About 20 percent of recordable injuries have the potential to be SIFs (see Exhibit 1).

Other core safety beliefs contribute to what ASSE’s Norris calls a “plateau of acceptance” regarding fatalities in particular.⁶ OSHA data, while of value, should not be the sole or primary metric for driving and assessing safety performance. The long-standing assumption that most injuries result from unsafe acts, fueled and reinforced by flawed incident investigations, is incorrect and unsupported.⁷ These beliefs are proving to be over-simplified, inaccurate, and often downright harmful.

Still, the belief in the inevitability of SIFs remains commonplace. This does not infer that organization leaders are callous. The problem is this: traditional safety efforts often fail to address SIFs because they’re not designed to. These design lapses are due in part to current measurement systems that create a “blind spot” for SIF prevention.

In many of the catastrophic events in recent years—Columbia, Challenger, BP Texas City, Upper Big Branch Mine, Deepwater Horizon—indicators of impending disaster were available but obscured by years of data showing the rate of recordable injuries was low, very low,

⁴ “Evolving Concepts in Fatality and Serious Injury Prevention,” Stephen Newell, JD, Dee Woodhull, CIH, CSP, Principals, Mercer ORC HSE Networks, 2012.

⁵ *Ibid.*

⁶ “ASSE President Continues Call for Action As Society Moves Into Its Next 100 Years, Reviews Challenges Ahead;” posted in American Society of Safety Engineers’ Newsroom Home on Wed., Jan 4, 2012; http://www.asse.org/en/index.php/press_releases/asse-president-continues-call-for-action-as-society-moves-into-its-next-100-years-into-its-next-100-years-challenges-ahead/

⁷ “Evolving Concepts in Fatality and Serious Injury Prevention,” Stephen Newell, JD, Dee Woodhull, CIH, CSP, Principals, Mercer ORC HSE Networks, 2012.

or improving. A group of BP leaders were visiting the Deepwater Horizon platform to celebrate a good employee safety record on the day it exploded.

In fact, SIF potential can be assessed. Systematic assessment of SIF potential enables SIF measurement and prevention. SIF prevention strategies must address less serious injuries with high potential for serious consequences and specific causes and correlates of SIF events.

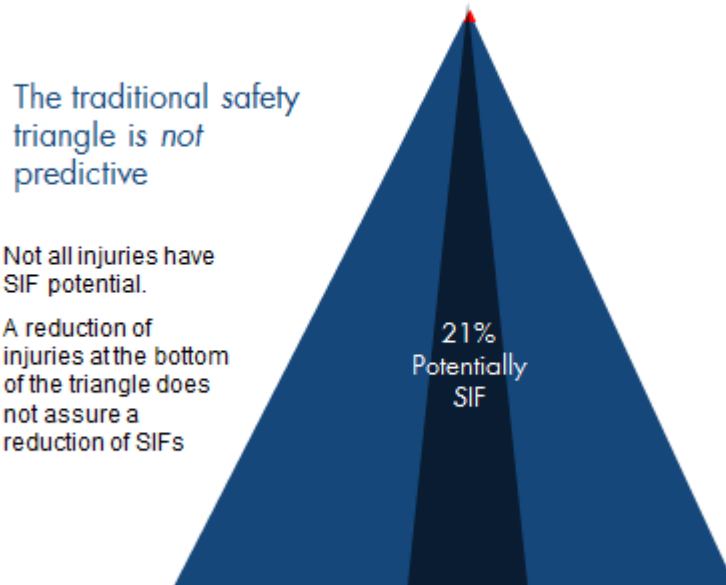


Exhibit 1. The traditional safety triangle is descriptive, but not predictive of the relationship between injury types.

The Critical Importance of Precursors

The key step is to identify, understand and mitigate SIF precursors. The term “precursors” is a profound new addition to the language of safety. Precursor data are a vitally important tool to assess safety risks, and give signals of impending problems. Use of precursor information eliminates leadership’s blind spot, gives visibility to previously hidden information. Precursors represent a leading indicator (not an after-the-incident reactionary measure) that reduces the potential to miss unmitigated exposures with high potential for SIFs.

An SIF precursor is a high-risk situation in which management controls are either absent, ineffective, or not complied with, and which will result in a serious or fatal injury if allowed to continue. Precursor events are unmitigated high-risk situations. Activities that may have high proportions of precursor events include:

- Mobile equipment (operation and interaction with pedestrians)
- Confined space entry
- Jobs that require lock-out tag-out
- Lifting operations
- Working at height
- Manual handling

Situations that may have high proportions of precursor events include:

- Process instability
- Significant process upsets
- Unexpected maintenance
- Unexpected changes
- High potential energy jobs
- Emergency shutdown procedures

The Mercer ORC Networks/BST study group found that, when an injury was related to operation of mobile equipment or watercraft, working under suspended loads, or working at elevations, 90 percent were or had potential to be SIFs.

When the injury was related to lockout/tagout, machine guarding and barricades, confined space entry, use of hot work permits, equipment and pipe opening of hazardous chemicals, 100 percent were or had potential to be SIFs.

Precursors precede the incidents to which they are related. During an emergency shutdown, workers are unable to follow the procedure because it is not understood and appears impractical. This is a precursor situation. Two workers must stand beneath a six-ton doctor roll in order to change it on a paper re-roller. This is a precursor activity.

Precursor data may vary by industry, employer, business unit, and even site.⁸ Companies should begin looking for SIF precursors by examining their own data. Precursor data should be drawn from all available sources: incidents, injuries, near misses, and exposures.

Addressing SIF precursors calls for flawless execution of pre-job planning and risk assessment, job safety analysis, behavior observations, assessments and audits, and risk tolerance.⁹ Enhancements are needed for incident investigation and root cause analysis processes. Remember, what categorizes a precursor is not its immediate outcome, but its potential to produce a serious outcome.

Two employees each suffer a minor cut. The actual outcomes are identical. But one cut occurred as a worker hustled across a busy office and sideswiped a sharp-edged desk. The other cut occurred when the worker slipped and nearly fell from the top of a rail car. To identify which of these two events is a precursor, ask yourself what would happen if the situations were repeated. The office worker would likely see a similar or better outcome. But the potential exists for the rail worker to suffer a fall from a height, resulting in a fatality or serious injury.

Assess Systems Integrity and Conformance

Safety systems should be examined to determine their effectiveness at identifying and mitigating precursors. A pipe leaks, it contains flammable material, no one reports the leak, no inspection identifies it, the leaking material finds an ignition source, and there is a fire.

The chance that this was the first and only time any of these events has occurred is low. It is much more likely that leaks have occurred previously, the reporting of leaks is sporadic, and

⁸ *Ibid.*

⁹ *Ibid.*

inspections are not comprehensive. Both the design of the safety systems targeting SIFs (their integrity), and the quality of how they are implemented (conformance) need to be assessed.

Recommendations

The Mercer ORC Networks/BST study group recommends four steps to prevent SIF events:

1. Educate the organization on the prevention of SIFs. Everyone at all levels of the organization must be aware and alert to the fact that just managing OSHA recordables is not enough. The company is still vulnerable to SIF exposures.
2. Institutionalize the concept of an SIF rate. The SIF rate is the number of serious and fatal injuries—and recordable injuries with reasonable potential to be an SIF—divided by hours worked. Data on the SIF rate should be gathered for the past two-three years and from this point forward. The SIF rate must have high visibility throughout the organization.
3. Embed findings from SIF assessments into existing safety systems, including pre-task risk assessment, observation and feedback, and incident investigation, so these systems now address SIF precursors. Enhance your incident investigation and root cause analysis protocols. Go beyond obvious errors to find latent conditions that may represent precursors.
4. Develop mechanisms to identify and mitigate SIF precursors using long-term strategies, such as longitudinal analysis (some precursors do not surface as significant without data analysis over time), predictive analysis (capturing relationships among many factors to assess the risk or potential risk of a particular situation or activity), and discovery conversations.

Conclusion

SIF events do not have to be inevitable or commonplace. The current plateau of SIFs is not something we are stuck with. SIFs can be understood, brought to light, and prevented. New findings regarding precursors challenge old assumptions. They represent a paradigm shift in how safety is analyzed and managed. Injuries, near misses and exposures with high potential to be SIFs should be documented and assessed for unmitigated high-risk situations, high-risk event combinations, and high-risk activities in order to prevent SIF outcomes. It is of urgent importance to apply these new principles to save lives and prevent life-threatening and life-altering injuries.