

THE PREVENTION OF LIFE-CHANGING INJURIES AND FATALITIES

TIJANA STANKOVIĆ¹, TAMARA RAĐENOVIĆ², SNEŽANA ŽIVKOVIĆ³

¹PhD student, University of Niš, Faculty of Occupational Safety, Niš, Serbia, tijana.stankovic@hotmail.com

²Assistant Professor, University of Niš, Faculty of Occupational Safety, Niš, Serbia, tamara.radjenovic@znr fak.ni.ac.rs

³Full Professor, University of Niš, Faculty of Occupational Safety, Niš, Serbia, snezana.zivkovic@znr fak.ni.ac.rs

ABSTRACT: In the past two years, the Republic of Serbia has seen gains in workplace safety, particularly as regards total reported injuries. In 2020 there is a 22.63% drop in reported injuries compared to 2019, according to the Ministry of Labor, Employment, Social and Veterans Affairs Work Report for 2020 and 2019. Nonetheless, this trend should not overshadow another disturbing trend in the workplace – that the number of life-changing injuries and fatalities has been on a much slower regression. While it is encouraging that the total reported incident rate is decreasing, the next step for safety excellence and the one Serbian Ministry currently strives to achieve, is the elimination of life-changing injuries and fatalities in the workplace. The paper presents an overview of life-changing injury and fatality prevention and how it is addressed by using incident and near miss data. The presented analyses will add benefit to the prevention improvement of life-changing injuries and fatalities.

Keywords: life-changing injury, prevention fatalities, risk, occupational safety.

INTRODUCTION

The reduction of injuries in the workplace presents challenges for safety professionals who seek to eliminate life-changing injuries and fatalities in their organizations. Unluckily, the reduction of life-changing injuries and fatalities means that organizations do not have enough information and data to mine and analyze. Ironically, it has become more difficult for organizations to predict when the next serious event will occur, because they have become so adept at preventing injuries.

Focus on life-changing injuries and fatalities still remains a critical moment in workplace safety. This article will present an overview of life-changing injury and fatalities prevention and how it is addressed by using incident and near miss data, assessing risk and severity, and focusing on life-changing injury and fatality prevention.

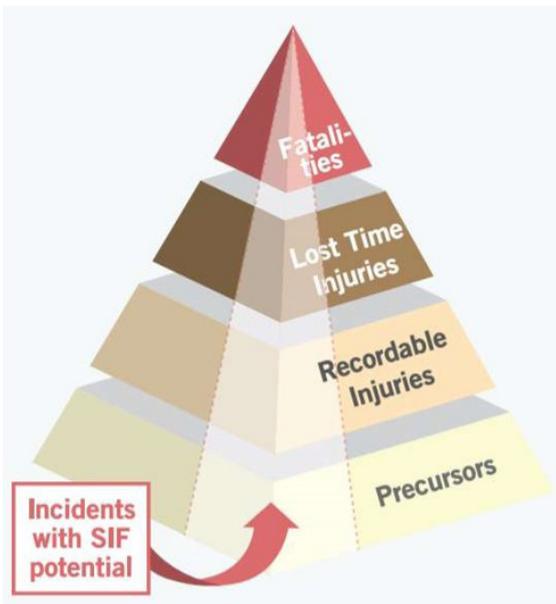
OVERVIEW OF LIFE-CHANGING INJURIES AND FATALITIES PREVENTION

If we want to understand how to prevent life-changing injuries and fatalities, we need to turn to a classic concept in occupational health and safety, Heinrich's safety triangle (Figure 1). Heinrich's theory highlights that for every major injury or fatality, there are 29 minor injuries and 300 non-injury incidents. This triangle is accepted as the gold standard in occupational health and safety practice.



Figure 1. Heinrich's safety triangle

Today, safety professionals realize that there is a drawback to this theory, as not all non-injury incidents or near misses are equal in terms of their potential to result in life-changing injury or the worst fatality



(Bellamy, 2015). Only some near misses have the potential that could lead to recordable injuries, such as life-changing injuries and even fatalities.

In order to prevent such injuries and fatalities from happening, many organizations have realized that they cannot look at the entire triangle. Rather, they have to isolate part of the triangle with the potential for life-changing injuries and fatalities in order to prevent those incidents from occurring (Figure 2).

Figure 2. The New Serious Injuries and Fatalities (SIF) Prevention Model (Manoukian, 2019)

Incidents with that kind of potential have different root causes and contextual factors leading up to them. Because of these differences, organizations need a different strategy in order to prevent them. Treating all minor incidents and near misses as if they have the potential to result in life-changing injuries and fatalities can take attention away from those incidents that contain the most potential to result in something really serious (Martin and Black, 2015).

All humans make errors, but an organization cannot do much about that, to create a safer workplace with zero injuries and fatalities. Fortunately, safety experts are able to look at the broader picture, for example, to design work processes in such a way as to eliminate human error. Namely, by applying the hierarchy of control (Figure 3), to develop all work processes and even corrective actions, safety can be less dependent on employee behavior and more dependent on the safety management system.

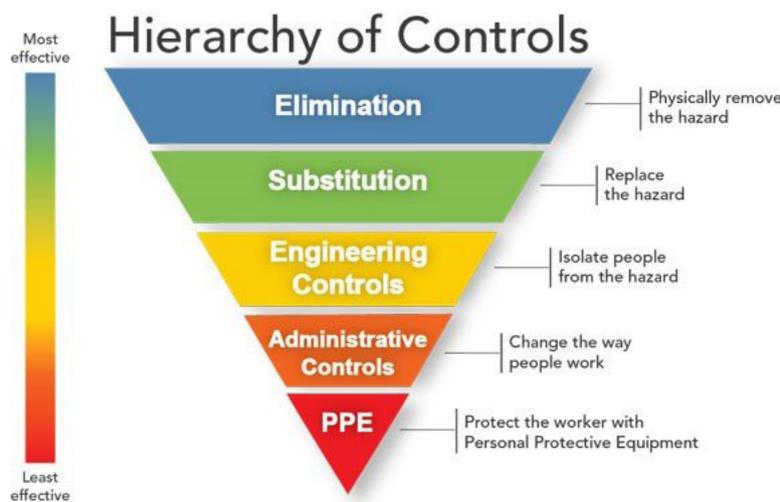


Figure 3. Hierarchy of Control Sample (DEKRA OSR Communication, 2020)

Based on the abovementioned it can be determined that Heinrich’s safety triangle is still useful for understanding the relationship among near misses, incidents, and injuries, but is not useful for conceptualizing the relationship between near misses and life-changing injuries and fatalities because events with the

potential for life-changing injury or fatalities are fundamentally different, i.e. humans will commit errors, but organizations should correct gaps in their safety management systems rather than “fixing” employees. To address the prevention of life-changing injuries and fatalities, we should begin with some definitions of concepts related to life-changing injuries and fatalities prevention (Loud, 2016).

CONCEPTS AND DEFINITIONS

A fatality is a well-defined term, but a quick look at the literature and internet research on life-changing injuries reveals that there is not an official definition. Having a definition of a life-changing injury does not make strategy development any easier to address organizational weaknesses or human errors that can lead to life-changing injury or fatality. The way of preventing these injuries and fatalities depends on the ability to identify those situations or activities that can have a high potential for them to happen. An event has the potential to lead to a life-changing injury or fatality if the situation could have been worse and could have resulted in life-changing injury or fatality if not for one factor. That one factor could be a control that is already in place, such as the location of a person or equipment, time of the day, weather conditions, etc.

An event can be considered as having a high potential for life-changing injury or fatality if it ranks high in a risk matrix scored on severity and probability. The risk matrix approach is common for identifying situations as having a high potential to lead to injury or fatality. The size and scales of the risk matrix may vary (see Table 1).

Table 1. Example of a risk matrix

3 Certain	3	6	9
2 Possible	2	4	6
1 Unlikely	1	2	3
X	1 Minor hurt	2 Recordable	3 Life-Altering

In the new safety triangle, those serious incidents with the potential for life-changing injuries and fatalities have different precursors. With Heinrich’s original safety triangle, safety professionals cannot simply reduce minor incidents and expect to reduce life-changing injuries and fatalities overall – the focus must be placed on the specific precursors that have the potential for life-changing injuries and fatalities.

Life-changing injuries and fatalities precursors have three key aspects: high-risk situations, risk tolerance, and data collection and analysis.

A high-risk situation is a situation where management controls are absent, ineffective, or not complied with, and will result in a serious, life-changing injury or fatality if allowed to continue. For example, we can look at the utility industry and working on power lines. This work is inherently high-risk because it takes place at height around high voltage lines but may involve high-risk activities that can lead to life-changing injuries or fatalities if workers do not wear or are not provided with the appropriate personal protective equipment, or if the training on how to properly operate the lift has lapsed. These breakdowns in management controls, if allowed to continue, could result in a serious injury or fatality for this particular work (Moura et al., 2016).

High-risk situations can include tasks that are known to be associated with high risks – such as working at height, confined space entry, working with hazardous energy, etc. Workers engaged in these

tasks can face increased risk when risk intensifiers are present. A risk intensifier is an environmental condition or another situational factor, which increases the severity or the probability that an incident will occur. We depend on our safety professionals to identify high-risk tasks and design controls, while we depend on workers and supervisors in the field to identify risk intensifiers and respond appropriately (Krause & Bell, 2015). A utility worker, working in a sub-grade storm sewer, would be considered engaged in a high-risk situation since the task involves a confined space entry. If that worker failed to follow proper entry protocols, such as completing atmospheric testing or lockout/tagout, and the work was permitted to continue under those conditions, then the potential for an incident would exist.

The second indicator is risk tolerance. Having a lowered risk tolerance or not having the pertinent information by which to make a proper risk assessment can lead people to approach work unsafely. When picturing a risk matrix, not all members of a work team will have the same axes of probability and severity in their minds, and not everyone will have the same scale for those axes. While it is important that members of a work team land on the same or similar risk rating of an event, more important is that everyone has the same risk matrix in mind and agrees on the calibration (Weber & Klement, 2018). The study conducted by Galizzi and Tempesti (2015) revealed that risk tolerance affects recurrent injuries, showing that more risk-tolerant individuals have fewer recurrent injuries than risk-averse ones. Additionally, the results point to the fact that individuals' specific risky behaviors lead to higher injury probabilities.

The final indicator is data collection and analysis that is not done in a mindful, targeted way. In order to be truly effective, data collection has to be much more than simply gathering numbers for the sake of gathering numbers. The data about life-changing injuries, fatalities, and near misses should provide organizations with useful and actionable information, as this is the only way for organizations to be proactive and use these leading indicators to prevent life-changing injuries and fatalities. Just because an event has not occurred before should not affect how one ranks it in terms of severity. When discussing safety data analysis in general safety decisions should always be grounded in empirical data that provide an accurate picture of the work being performed. The analysis of work tasks should be able to answer what exactly are workers being exposed to, while the analysis of corrective actions should be able to answer if workers are being protected effectively (Moura et al., 2016).

Job safety analyses are very common on construction sites because construction work is fraught with safety issues and potential hazards and incidents. It does not make sense to create a job safety analysis for every single piece of work conducted on a construction site - even when most things do carry some inherent danger. Construction permits - which are created for many high-risk construction activities - often take care of this by requiring a high-level risk assessment and job safety analysis. But other construction activities and general phases of work may require only a job safety analysis.

Three indicators are important: the normalization of deviation, an uncalibrated risk tolerance, and decisions with safety consequences not grounded. It is possible to imagine an example of a situation that involves all three of these indicators: a workplace where things have "always been done this way", a team supervisor who was raised in the company system and therefore lacks a calibrated risk perception, or a team that ignores the incidents and events at other sites just because it has never happened at their site. For instance, there may be an excess of workers improvising in the field because they do not have adequate knowledge of the official procedure. It could also be that workers have developed workarounds for the sake of efficiency, yet this is a compromise to safety. The application or interpretation of the work procedure may be inconsistent. Variances for work procedures may be granted too easily and may be coupled with ineffective management of those exceptions or variances. Any of these normalizations of deviation could be a precursor or error-likely situation that could result in life-changing injury or fatality.

THREE STEPS FOR DEVELOPING LIFE-CHANGING INJURY AND FATALITY INTERVENTION STRATEGIES

The first is to educate everyone in the organization about life-changing injury and fatality exposure, particularly senior leaders who may still lean on safety and injuries/fatalities through Heinrich’s classic triangle. It is important for everyone in an organization to be alert to the risks and exposures that could lead to life-changing injury and fatality, especially given that risk perception may be affected by the downward trend in non-fatal injuries.

The second step is to provide visibility to life-changing injury and fatality exposure. Intense focus on the life-changing injury and fatality potential of near misses and incidents is what provides organizations with the leading indicator data necessary for taking proactive measures.

The last step is to identify predecessors for life-changing injuries and fatalities. Identifying predecessors requires that safety and operations people conduct gap analyses of their procedures, controls, and employee behaviour. Conducting such analyses and using life-changing injuries and fatalities decision exposure flow charts can help organizations determine if a situation or work task has predecessors that could lead to life-changing injuries and fatalities (see Figure 4). These are the methods that organizations can use to pinpoint those error traps, error-likely situations, and organizational weaknesses (Pierce, 2016).

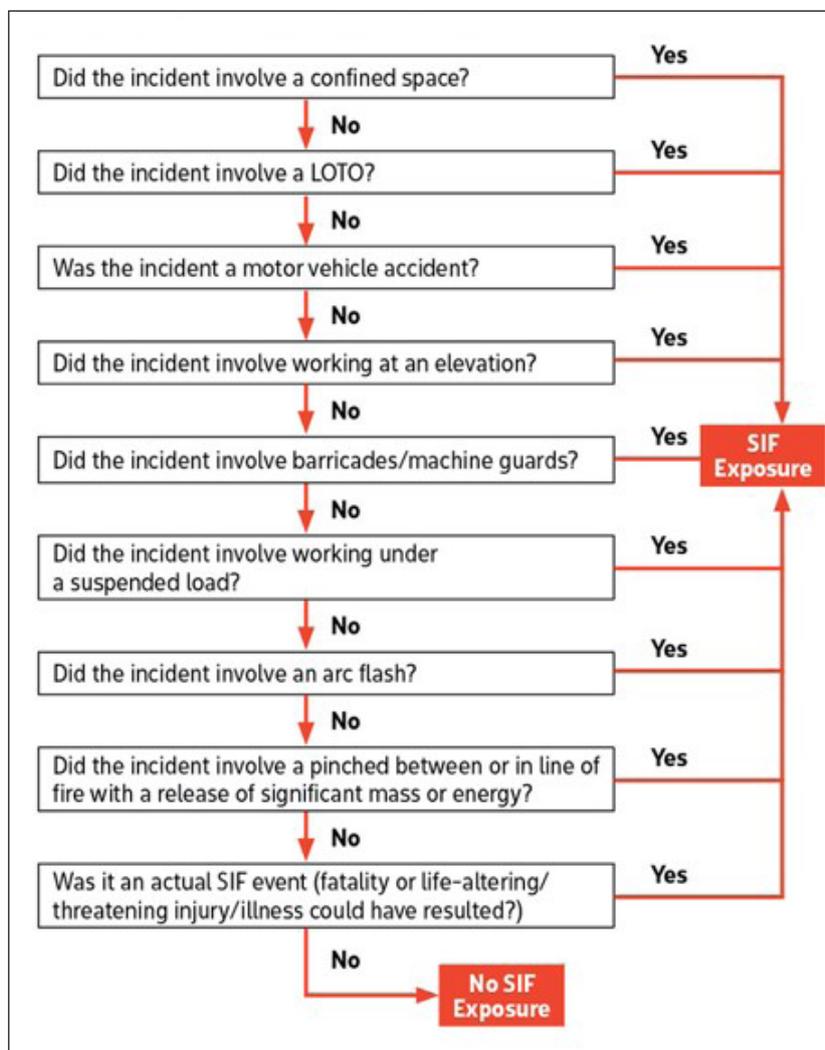


Figure 4. Decision Tree Sample (O’Conor, 2020)

Most of the preventive measures for life-changing injuries and fatalities are housed within the job hazard analysis and pre-task risk assessment procedure. Our ability to prevent life-changing injuries and fatalities is better when we have more frequent checks of risk potential before, during, and after the work activity. Does job hazard analysis involve everyone on the team that will be part of the work activity? Is there a reassessment of risk potential during the work activity? Has everyone agreed on the triggers for a pause or stop of work? Asking these questions during the pre-task risk assessment phase and throughout the work process can help work teams to more promptly assess the level of risk potential associated with the work tasks.

Organizations should pay attention to changes that can be made at an organizational level to the safety management system (Moura et al., 2016). Corrective actions should be designed to be more mature along the hierarchy of controls (see Figure 3). Less mature controls are those that the most depend on employee behaviour and should be avoided, like relying on them to put on personal protective equipment. The most mature controls the least depend on employee behaviour and mitigate the risk to the worker.

Efficient strategies for preventing life-changing injuries and fatalities should combine elements such as altering the employer's awareness of risk situations; encouraging their active involvement in identifying the probable exposures and handling them through numerous profoundly embedded practices, which are projected to ensure each employee is conscious of actions to be performed for accomplishing every task safe and sound and empowered to freely speak about any concerns (Baker & Clone, 2016).

COACHING AND TRAINING FOR LIFE-CHANGING INJURIES AND FATALITIES PREVENTION

Organizations can commit to life-changing injury and fatality prevention as one of their corporate strategies in order to bring awareness and resources to the topic. All employees must be trained in the life-changing injury and fatality prevention approach during the annual safety training. Additional executive, manager, and employee-specific training and awareness initiatives afterward can explain the value of assessing potential risk, the need to report all incidents no matter the actual outcome, and the roles and responsibilities of each person to support incident prevention. Incident prevention terminology and tactics should be incorporated into existing tools and practices for constant reinforcement. Incident investigation teams that perform root cause analyses after events can share the information with other work teams when there are lessons to be learned. Ivascu and Cioca (2019) point out that the involvement of organizational culture and individual motivation can help in reducing the impact of occupational accidents. They conclude that the existence of an investigative preventive model is helpful for managers to understand the steps that contribute to reducing accident rates. Also, Sorensen et al. (2018) highlight that leadership commitment and participation, as well as policies, programs, and practices that foster supportive working conditions, are essential for protecting and promoting worker safety, health, and wellbeing.

COMMUNICATION AROUND THE LIFE-CHANGING INJURY AND FATALITY PREVENTION

Organizations should require an Executive Incident Review and Lesson Learned Summary for all High Potential Incidents. Medium and low-potential incidents receive investigation, review, and share learning at every level of management corresponding to the potential risk. During this research, it is noticed that some organizations have already integrated high potential incident awareness into their weekly communications. Organizations also can include monthly business reviews which have a robust safety component where operational leadership reviews their safety core value metrics performance and any recordable

or high potential incidents (Burke, 2022). Prevention efforts and near-miss reporting should be praised and reinforced formally and informally through recognition programs (Thoroman et al., 2018).

METRICS AND ORGANIZATIONAL TARGETS FOR LIFE-CHANGING INJURIES AND FATALITIES PREVENTION

Some organizations still track traditional safety metrics (such as Total Recordable Incident Rate - TRIR and Days Away, Restricted, or Transferred - DART), but several are also tracking metrics that are specific to life-changing injuries and fatalities prevention such as close calls (near misses), and have their targets set to have zero life-changing injuries and fatalities.

Like near-miss reporting programs in general, organizations can expect to see a spike in the number of near-misses when they roll out the program because people are more aware of hazards in their environment, or they feel more comfortable reporting the things they have been seeing. As noted earlier, workplaces have been getting better at reducing and preventing the minor injuries that drive up the recordable rate, but they still have several instances that were close to having life-changing injuries or even fatalities. Placing more attention to the life-changing injuries and fatalities potential metric provides a better picture of the state of safety at an organization.

LEADERSHIP SUPPORT OF LIFE-CHANGING INJURIES AND FATALITIES PREVENTION EFFORTS

Executive leadership is crucial for the resources and timely implementation of life-changing injury and fatality prevention efforts. The safety team will probably develop additional trust with its executives by demonstrating respect for their time and positions of authority through the life-changing injury and fatality prevention approach. Instead of involving them in the review of every recordable incident (which is a mostly medium or low-potential risk), they should only be asked to review and discuss incidents with life-changing injury and fatality potentials. Safety professionals should provide reports that are more streamlined, fit for purpose, and better use of executives' time and expertise. In addition, triaging the incident review and corrective action responsibility to the corresponding level of management based on low, medium, or high potential risk reinforces ownership and standardizes escalation to an appropriate level of authority.

Without the support of executive leadership, nothing would happen in the organization; their support is highly critical. Leadership is highly engaged in the discussions around life-changing injuries and fatality prevention programs and in safety in general.

BARRIERS AND SUCCESSES IN IMPLEMENTING A LIFE-CHANGING INJURY AND FATALITY PREVENTION PROGRAM

To go from the concept of a life-changing injury and fatality prevention program to actual implementation, organizations should be careful planning around the process and roles and responsibilities of the – who submits data and how, who reviews the data, the criteria for determining life-changing injury and fatality potential, etc. The concept of life-changing injury and fatality prevention needs to be thoroughly discussed and owned by the entire organization, especially those who are most exposed to risks. These individuals should be closely tied to the people who can make resource decisions about the types of defenses and controls that can be put in place (Thoroman et al., 2018).

There can be many barriers to implementing a life-changing injury and fatality prevention program. One is that it can be difficult at the outset to get all in the organization calibrated in terms of the relevant

precursors to report. Also, not everyone has the same preconceptions of risk, which may result in underreporting or irrelevant reports. Life-changing injury and fatality prevention is not a topic around which there is much standardization or best practices, which can make it difficult to take a life-changing injury and fatality prevention program from concept to implementation.

Another barrier can be the different perceptions and priorities of leadership, seeing as they may weigh aspects of risk differently based on roles and responsibilities. Communication about life-changing injury and fatality prevention cannot remain fully at the top of the organization; the information must be driven to employees as well. Not extending this information to frontline employees can result in more of a divide between leadership and employees in terms of their perceptions and prioritization.

CONCLUSION

The topic of life-changing injury and fatality prevention is far from being completely explored.

Organizations with superior records in health, safety, and environment (HSE) constantly seek ways to improve upon HSE. It is not surprising that many of them have already embarked on designing programs, training, and messaging that focus on preventing life-changing injuries and fatalities. They have noticed a drop in their non-fatal recordable injury rate, but their fatality rates may not be at zero – and one fatality is one too many.

Organizations cannot focus attention only on simply “fixing the employees” to prevent life-changing injuries and fatalities. Attention should be paid to changes that can be made at an organizational level to the safety management system.

ACKNOWLEDGEMENTS

This research was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Agreement No. 451-03-68/2022-14/200148).

REFERENCES

- Baker, F. J., Clone, G. A. (2016). Strategies for Preventing Fatal and Life-Changing Injury Events. Paper presented at the ASSE Professional Development Conference and Exposition, Atlanta, Georgia, USA, June 2016.
- Bellamy, L. J. (2015). Exploring the relationship between major hazard, fatal and non-fatal accidents through outcomes and causes. *Safety Science*, 71, pp. 93-103.
- Burke, W. (2022). Organization Development. *Oxford Research Encyclopedia of Psychology*. <https://oxfordre.com/psychology/view/10.1093/acrefore/9780190236557.001.0001/acrefore-9780190236557-e-734>.
- DEKRA OSR Communication (2020). More Than Masks: Using the Hierarchy of Controls to Help Prevent Spread of COVID-19. <https://www.dekraosrblog.com/helppreventspreadofcovid-19>
- Galizzi, M., & Tempesti, T. (2015). Workers' Risk Tolerance and Occupational Injuries. *Risk analysis: an official publication of the Society for Risk Analysis*, 35(10), 1858–1875. <https://doi.org/10.1111/risa.12364>
- Ivascu, L., & Cioca, L. I. (2019). Occupational accidents assessment by field of activity and investigation model for prevention and control. *Safety*, 5(1), 12.
- Krause, T., Bell, K. (2015). 7 Insights into safety leadership. The Safety Leadership Institute. ISBN: 978-0-9966859-0-0.
- Loud, J. (2016). Major risk: Moving from symptoms to systems thinking. *Professional Safety*, 61(10), pp. 50-56.
- Manoukian, J-G. (2019). Classify a near miss on its potential for serious injury or fatality, *Health, Compliance*. <https://www.wolterskluwer.com/en/expert-insights/classify-a-near-miss-on-its-potential-for-serious-injury-or-fatality>
- Martin, D. K.; Black, A. (2015). Preventing serious injuries and fatalities. *Professional Safety*, 60(9), pp. 35-42.
- Moura, R.; Beer, M.; Patelli, E.; Lewis, J.; Knoll, F. (2016). Learning from major accidents to improve system design. *Safety Science*, 84, pp. 37-45.
- O’Conor, T. (2020). Seriously Dangerous: SIF Metrics and Prevention Strategies. <https://www.ecmag.com/section/your-business/seriously-dangerous-sif-metrics-and-prevention-strategies>
- Pierce, B. (2016). How rare large, multiple-fatality work-related incidents? *Accident Analysis & Prevention*, 96, pp. 88-100.

- Sorensen, G., Sparer, E., Williams, J. A., Gundersen, D., Boden, L. I., Dennerlein, J. T., ... & Wagner, G. R. (2018). Measuring best practices for workplace safety, health and wellbeing: The Workplace Integrated Safety and Health Assessment. *Journal of occupational and environmental medicine*, 60(5), 430.
- Thoroman, B., Goode, N., Salmon, P. (2018). System thinking applied to near misses: a review of industry-wide near miss reporting systems, *Theoretical Issues in Ergonomics Science*, 19:6, 712-737, DOI: 10.1080/1463922X.2018.1484527.
- Weber, E. U., Klement, J. (2018). Risk Tolerance and Circumstances. CFA Institute Research Foundation. ISBN 978-1-944960-39-1.

Received: March 24, 2022

Accepted: July 25, 2022

