



Safety Expectations

Finding a Common Denominator

By Vladimir Ivensky

The spectrum of achieved levels of OSH care and results (occupational mortality, injury and illness rates) varies between countries, industries and companies with an overall tendency for improvement. However, the occupational injury rate reductions achieved in the past decade and earlier are affecting more the low severity end of the incidents spectrum, while serious injury and fatality (SIF) incident rates are declining at a slower pace (Mangan, 2015; Manuele, 2003).

The strategy to accelerate the decline of serious and fatal occupational injuries is the subject of ongoing debate in the OSH profession. According to Mangan

(2015), the discrepancy between the reduction achieved with SIF rates versus that achieved with relatively minor cases exists in part because companies' operational leadership and safety practitioners treat all incidents the same, while in reality only about 20% of incidents have the potential to become an SIF. One reason that operational lead-

ership might treat all incidents the same may be a presumption that all OSH risks must be controlled equally no matter their severity potential in order to achieve the zero harm expectations that are embedded in many OSH programs.

This article discusses OSH risk assessment techniques as applied to zero harm programs, and describes ways to bring OSH expectations and strategies to a common denominator among all project stakeholders to better prevent serious incidents.

Safety Expectations: Parties Involved

In today's marketplace, companies' expectations of employee and subcontractor safety performance are driven by both ethical obligations and market pressures for competitiveness, as safety performance has become an important differentiator in many industry sectors.

For the purpose of this discussion, the following parties are considered as having some vested interest in OSH, and having specific expectations from OSH programs:

- project owner/client;
- prime contractor management;
- prime contractor employees;
- subcontractor management;
- subcontractor employees;
- public and regulators.

The safety-sensitive client expects excellent safety performance at its project sites, relying mostly on its prime contractor (and its own enforcement of safety programs). For the prime contractor, excellent safety performance is, therefore, a project deliverable. The prime contractor would communicate the client's and its own safety expectations and requirements to its subcontractors and expect excellent safety performance from its own employ-

IN BRIEF

- Over the past decade, occupational injury rate reductions have primarily affected low-severity incidents, while serious injury and fatality rates decline more slowly.
- One reason may be that operational leadership presumes OSH risks must be controlled equally regardless of severity potential.
- This article discusses OSH risk assessment techniques as applied to zero harm programs, and ways to bring OSH expectations and strategies to a common denominator among various parties involved in a project.

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ees and the subcontractors' employees. Possible OSH expectations are summarized in Table 1.

Employers' (and clients') interest in managing the outcome of relatively minor incidents within OSHA's definition of first aid or their willingness to apply modified/restricted work programs to avoid lost-time incident cases may conflict with the injured person's interests (when overzealous case management approaches are applied). The associated efforts may also be time consuming, and the effort may be better spent on serious injury incident prevention. It may be in the OSH industry's interest to overcome that controversy, potentially by modifying OSHA's recordkeeping system toward emphasizing high-potential incidents (no matter the outcome) and de-emphasizing low-potential and low-severity cases as a competitive differentiator by utilizing, for example, approaches similar to those used in the U.K.'s Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013 (HSE, 2015b; Ivensky, 2015).

Ultimate Safety Expectation: Zero Harm

The popular zero harm OSH philosophy suggests the ultimate goal of OSH: zero occupational injuries and illnesses for all workers and for anyone affected by a company's business. Many companies and groups have adopted this philosophy in their safety (and quality) programs. Zero harm, however, has not been achieved consistently anywhere and the ways to achieve it, the possibility of achieving it, or even an ultimate benefit of zero harm programs for the prevention of SIFs are the topics of discussion within the OSH profession.

For example, a recent opinion survey among the readers of *Safety+Health*, who are predominantly OSH professionals, indicates that only 45.5% of respondents believe that zero injures is a realistic goal (NSC, 2014).

The Australian company Human Dimensions surveyed more than 21,000 participants across industries such as construction, mining, manufacturing and government, and found that only 35% of the workforce believes in the concept of zero harm (Long, 2011).

Comments submitted to the *Safety+Health* survey (NSC, 2014) and to other OSH discussion forums [e.g., Safety Institute of Australia's (2009) OSH discussion forum] reveal the active, emotional debate generated by zero harm safety programs.

The opinions expressed fall into two general camps:

1) Zero harm is the only ethical approach to safety. We cannot have any other goal than zero. Anything else would be the declaration of an acceptance that it is okay to hurt people. An example of this point of view:

Statistically speaking, the likelihood of zero harm is extremely low. However, the vision of zero harm is not about numbers. It is about a philosophy that no one should get hurt. It is about people. If the vision is not zero harm, what should the vision be? Should we aim for two harm or three deaths?

Table 1

Company & Individual OSH Expectations

Company	Individual
<ul style="list-style-type: none"> •Low (or zero) OSHA recordable case rate, discounts on workers' compensation insurance, no regulatory citations, no litigation •Enhanced competitiveness (reputation) •Low (or zero) financial loss 	<ul style="list-style-type: none"> •Safe work environment •No work-related OSH incidents (whether OSHA recordable or not) that would impact personal health beyond the day of the incident •Zero personal financial loss

2) The zero harm goal is unachievable and leads to misallocating safety resources to multiple minor hazards, increasing the risk of missing the major hazards. An example of this point of view:

We are kidding ourselves if we think we can prevent all personal damage; why have a goal that is unrealistic? The reality is that while we are spending time, effort and money on minor damage we are misallocating resources that are better directed at serious personal damage. Realistically there are limitations to what [company] resources can be applied; let's get the biggest bang for our buck.

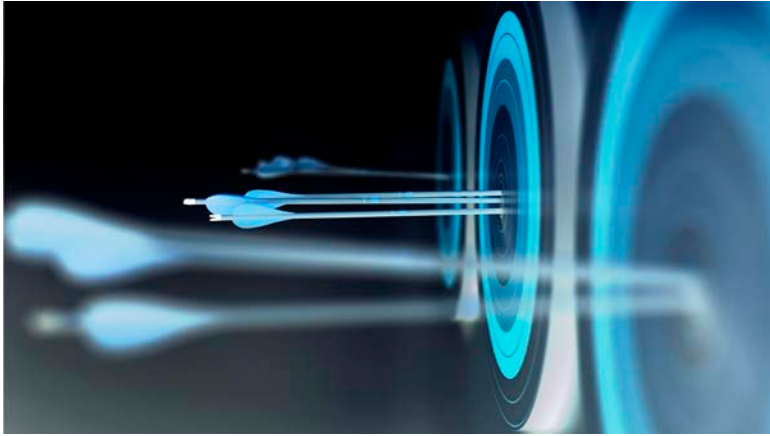
While the first point of view is widely represented in many companies' zero harm safety policies and programs, the second argument appears with increased frequency in the OSH literature (Burnham, 2015) and blogosphere (NSC, 2014; Safety Institute of Australia Ltd., 2009), and noticeably in Long's (2011; 2012) articles and monographs, which provide an excellent literature review on the topic.

While beneficial, the concentration on high-frequency/probability, simple and easily observable events (e.g., speeding, not wearing hard hat, not wearing hearing protection, wrong lifting techniques) may obscure addressing more sophisticated, technical and not easily observable hazards that require professional safety support, and may delay implementation of needed engineering and systemic controls, the ultimate area of concentration.

Manuele (2003) elaborates on a similar concern:

[U]nfortunately, many safety practitioners continue to act on the premise that if efforts are concentrated on the types of accidents that occur frequently, the potential for severe injury will also be addressed. That results in the severe injury potential being overlooked, since the types of accidents resulting in severe injury or fatality are rarely represented in the data pertaining to the types of accidents that occur frequently. A sound case can be made that many accidents resulting in severe injury or fatality are unique and singular events.

Manuele (2003) also states that Heinrich's related premise that the predominant cases of no-injury



While many companies' safety policy statements declare that all incidents are preventable, only about 45% of OSH professionals and 35% of the workforce surveyed elsewhere share that belief, according to data reviewed.

incidents are identical to the predominant cases of incidents resulting in major injuries is invalid.

Burnham (2015) suggests asking eight questions "before using zero as a safety target":

- 1) How well will zero as a target motivate employees?
- 2) What is the organization's true purpose?
- 3) To what extent is the company willing to support perfection?
- 4) How can the company control all the factors that contribute to injuries?
- 5) What cognitive limitations make people susceptible to error, even in the best management systems?
- 6) How could zero as a target undermine the ability to lead?
- 7) How could zero as a target hinder the organization's ability to learn?
- 8) Instead of zero, what approaches can a company focus on to achieve better results?

Burnham (2015) concludes:

[S]etting zero as a target may seem logical, but it could harm an organization's safety efforts. It may have questionable effects on employee motivation; it may involve assumptions that are either wrong or unreliable; and it may prevent an organization from improving.

It would be logical to review and discuss how zero harm programs differentiate from traditional safety programs and the ways zero harm programs envision achieving the ultimate goal of an injury- and illness-free workplace.

Zero Harm vs. Traditional Safety Programs

Zero-harm safety programs come under many brands. Searching via Google for "zero harm" results in an array of corporate zero harm safety program brands and logos (e.g., "Target Zero"; "Zero

Accident"; "Zone Zero"; "Zeroing on Safety"; "Mission Zero"; "Reaching Zero"; "Vision Zero").

The zero harm philosophy is typically defined in a company's safety policy statements, supplementing traditional safety program systems such as those described, for example, in ANSI/ASSE Z10-2012, Occupational Health and Safety Management Systems (ANSI/ASSE, 2012). That standard includes a review and comparison of major modern occupational safety and health management systems, illustrating significant similarity in OSH management around the world.

The Z10 standard (as well as many similar systems) includes sections on management leadership and employee participation; project and task OSH planning; risk assessment; OSH program implementation and operation; evaluation and corrective action; encouraging employee participation; management review; roles and responsibilities, policy statements; assessment and prioritization, incident investigation and audit. The hierarchy of controls is also a part of the Z10 standard.

Additional elements typically present in zero harm programs include:

1) Expressed belief that all incidents are preventable and a goal of zero incidents. Example: "We believe all incidents are preventable and that working injury-free is possible." The statement can include some supporting clauses, such as "Our ultimate goal is to operate injury-free. We know this is possible because most of our facilities already operate injury-free on a rolling 12-month basis." It appears that those declarations apply to all company employees and management, but it is difficult to confirm whether that belief is actually shared by everyone in the company, or whether it is an implied condition of employment.

2) Program uniqueness in finding a correct key to injury-free work: "ABC Zero is not a typical safety program. As we are all aware, there are many other 'zero' programs out there, but ours is different in the responsibility and accountability it places with each of you. We will not simply be talking about safety; we will be living it, measuring for it and planning to reach our ultimate goal: zero incidents."

3) Local origin: "ABC Zero was born out of your feedback and direction from the survey many of you completed."

4) Reliance on behavior-based safety: "ABC Zero is based on our belief that human factors are the biggest area of opportunity when it comes to being and working safely."

5) Ambition: "ABC Zero is (or is striving to be) a world-class safety program."

Another important aspect is the purpose of the company's OSH program. One company states the purpose of its zero-harm-driven corporate safety program as follows:

To ensure that every employee holds health, safety and environment as a cultural value and believes every incident is preventable, and that employees work safely, protect the environment and lead the company to a sustainable future.

A more traditional (and OSHA's General Duty Clause-driven) safety policy purpose would sound more like the following:

To share and communicate our commitment to providing a workplace free from hazards.

The preceding statements mark the fundamental difference in philosophies and approaches to safety management. While any employer is obligated by regulation to provide a workplace free from recognized hazards to its employees, zero-harm programs strive to ensure a belief among all employees that all incidents are preventable. That aspect was characterized by Long (2011) as an "ideology with the elements of a cult."

The task of transforming people's beliefs on any subject, including the subject of preventability of all incidents, can be challenging at best, considering that no consensus on that topic exists even among scientists or OSH professionals. It is hard to expect all employees and managers to subscribe to any company-driven ideology (whether correct or not). This is not to diminish the critical importance of developed safety cultures and effective senior leadership involvement for the overall success of any safety program.

Appendix A of ANSI/ASSE Z10-2012 provides several examples of policy statements:

- Create a safe and healthy workplace, and build a respect for the environment.
- Continually improve its OSH performance.
- Conform to the spirit as well as the letter of applicable laws and regulations.
- Integrate OSH considerations into business planning, decision making and daily activities.
- Provide resources and training to carry out this policy.
- Communicate our OSH policy.

Another OSH policy statement example provided in Z10 includes language such as "no compromise of an individual's well-being in anything we do" and "the implementation of actions to help realize a healthy, injury-free work environment is a leadership responsibility."

From the hierarchy of controls perspective (ANSI/ASSE, 2012; NIOSH, 2015), "managing workplace culture in a way to instill a belief that all incidents are preventable" may be classified as an administrative control (i.e., changing the way people work). At the top of the hierarchy are the most effective control elements such as elimination of the hazard, substitution with a less severe hazard (e.g., selecting a less toxic chemical) and engineering controls.

From the perspective of appealing to improved safety culture, changing people's beliefs on incident causation and preventability, and concentrating on the human factors as the greatest opportunity for improvement. Zero harm programs belong primarily to a category of behavior-based safety (BBS) programs and ongoing discussions on zero harm effectiveness, applications and further development are part of wider discussions on BBS programs.

Zero Harm: Necessary Conditions

Theoretically, succeeding at zero harm would require a reliance on comprehensive integrated safety management systems including leadership, management and technical (engineering) components. The systematic approach to zero harm would include several steps:

1) Determine the incident to be prevented by the program. Would it be OSHA-recordable cases? Would first-aid cases also be included? What about high-potential dangerous occurrences and near-hits?

2) Ensure that operations (e.g., tasks, projects) are conducted in closed systems (i.e., where all hazards are completely controllable). This means that any uncontrollable third-party-related risks may need to be excluded. Driving is an example of operating in an open system, where third-party drivers can cause motor-vehicle incidents that DOT officially classifies as nonpreventable (e.g., a rear-end collision of a company driver who was driving in full compliance with traffic regulations). According to the zero harm assertion that all incidents are preventable, rear-ending incidents are also preventable by the offenders. However, the zero harm company has no control over those offenders. Laboratory operations or plant operations are good examples of closed systems in which an employer can identify and control to a specific degree all work parameters including exposure to any OSH hazard.

3) Eliminate completely all safety risks within the closed system. In this case "no compromising on safety" would mean that no compromise is made on costs or efforts to achieve 100% risk elimination for any incident, defined as a subject of a zero harm program (step one). This may contradict traditional OSH programs that are based on the premise of reasonable care and acceptable residual risk. No modern risk management approach in occupational safety guarantees complete elimination of all occupational risk. Elimination of safety risk would include elimination of any unsafe conditions and acts, including human errors or eliminating their influence on the outcome of an incident.

When subcontractor safety performance is included in the prime contractor's or hiring contractor's zero harm program, the cited conditions should be applied to the subcontractors. This creates an additional significant challenge as the level of control over subcontractors' employees is lower than over a company's own employees. Furthermore, the level of the subcontractor's safety program maturity, while it may be acceptable by common prequalification criteria, may not be sufficient to achieve zero harm performance.

Zero Harm & ALARP

Traditional OSH programs are not designed to eliminate 100% of risk. For example, in industrial hygiene, the ACGIH (2015) threshold limit value (TLV), time-weighted average (TWA) for occupational exposures for chemical substances (significantly more stringent than current OSHA permissible exposure limits) is defined as:

Figure 1

Risk Assessment Codes in Activity Hazard Analysis

Overall Risk Assessment Code (RAC) (Use highest code)					L
RAC Matrix					
Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **Hazard** with identified safety **Controls** and determine RAC (see above)

Probability is the likelihood to cause an incident or near hit, and is identified as Frequent, Likely, Occasional, Seldom or Unlikely.	RAC Chart
Severity is the outcome/degree if an incident or near hit did occur and is identified as Catastrophic, Critical, Marginal or Negligible	E = Extremely High Risk
	H = High Risk
	M = Moderate Risk
	L = Low Risk

Step 2: Identify the RAC (Probability/Severity) as E, H, M or L for each Hazard on activity hazard analysis (AHA). Annotate the overall highest RAC at the top of AHA.

Note. Adapted from Safety and Health Requirements Manual (EM 385-1-1), by U.S. Army Corps of Engineers, 2014, Washington, DC: Author.

TLV-TWA. The TWA concentration for a conventional 8-hour workday and a 40-hour work week, to which it is believed that nearly all workers may be repeatedly exposed, day after day, for a working lifetime without adverse effect.

Note the terms *believed* and *nearly all*. They indicate an uncertainty, typical in any risk assessment, including human health and safety risk assessment. Another example of such uncertainty are variable permissible exposure limits for the same chemical substance in various regulations.

EPA's (2005) risk assessment guidance and tools, for example, Guidelines for Carcinogen Risk Assessment, is another example of a scientific approach to calculating human health risks, in that case based on the exposure duration and adsorbed or ingested doses of carcinogenic and noncarcinogenic chemicals. The document discusses and considers multiple uncertainties in great detail. The acceptable risk defined by the guidance is never a zero.

For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent lifetime cancer risk to an individual of between 10^{-4} (1 in 10,000) and 10^{-6} (1 in 1,000,000) using information on the relationship between the exposure dose and response. (EPA, 2005)

U.S. Army Corps of Engineers' (2014) *Safety and Health Requirements Manual* EM 385-1-1 requires an activity hazard analysis (AHA) (Figure 1) conducted "for each work activity involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or subcontractor is to perform the work." The AHA process is an OSH risk assessment tool. It defines the activity or work to be performed, identifies the hazards and

establishes controls to reduce the hazards to an acceptable risk level. The risk assessment code (RAC) matrix in the AHA process requires classification of task-specific risks by severity and probability as extreme (E), high (H), medium (M) and low (L).

The USACE OSH program requires RACs classified as extremely high or high after implemented controls to pass additional review and acceptance from the government designated authority. There is no expectation that all residual risk will be classified as low and there is no classification of zero risk in the AHA risk assessment process or in any known similar processes (e.g., job safety analysis, job hazard analysis). When residual risk is permissible within the standard of care, the probability of an incident is always present and never equals zero. Zero harm within the existing AHA and similar processes is not achievable unless all risks are effectively eliminated and driven to zero. In the author's view, high risk cannot be accepted, but neither can moderate or low risk be accepted in any activity hazard analysis if the zero harm target is adopted.

The concept of a tolerable risk, in the author's opinion, contrary to the zero harm concept, is well illustrated by the principle of as low as reasonable practicable (ALARP), developed by the U.K.'s Health and Safety Executive (HSE, 2015a) (Figure 2).

ALARP divides OSH risks into three categories. At the top is intolerable risk: that which cannot be accepted no matter how high the controllable costs. At the bottom is the negligible risk: that which is considered acceptable residual risk. The tolerable risk is located in between intolerable risk and negligible risk. Tolerable risk is that which can be tolerated when cost-effective measures have been implemented.

Anyone operating in the tolerable risk region must demonstrate that effective risk review has been conducted and that the cost-effective controls are in place that provide the lowest reasonably achievable risk possible. While the definitions of intolerable, tolerable and negligible risks are open to interpretation, the ALARP approach contradicts the zero harm expectations as residual risk is tolerated in ALARP and the cost-benefit analysis on controls, to some degree, is a "compromising on safety" while zero harm programs are declaring "no compromising on safety" as a core principle.

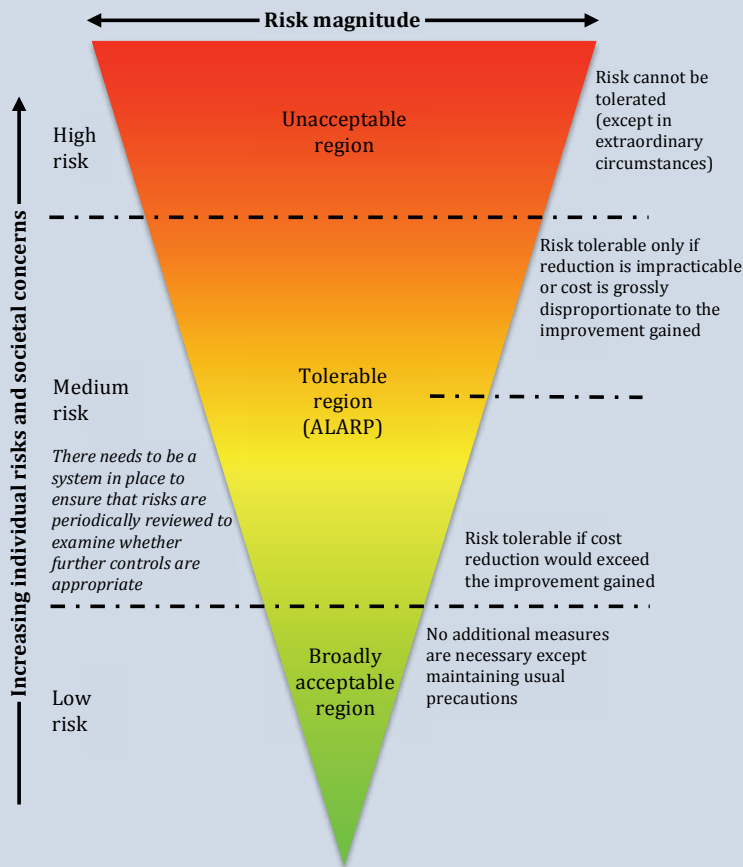
Conclusion

- There is an ongoing discussion on zero harm safety program with the arguments ranging from "Zero harm is the only ethical approach to safety" to "The zero harm goal is unachievable and leads to misallocating safety resources to multiple minor hazards, thereby increasing the risk of missing the major hazards."

- Zero harm programs belong primarily to a category of BBS programs and ongoing discussions on zero harm effectiveness, applications and further development are part of wider discussions on these programs. The argument on misallocating safety resources to numerous minor hazards with the existing risk of an incident caused by a unique

Figure 2

As Low as Reasonably Practicable (ALARP)



Note. Adapted from www.risk-assessments.org.

unrecognized major hazard is also present in BBS program evaluations.

- While many companies' safety policy statements declare that all incidents are preventable, only about 45% of OSH professionals and 35% of the workforce surveyed elsewhere share that belief, according to data reviewed.

- Traditional OSH programs are not designed to eliminate 100% of risks. Reviewed risk assessment and risk management approaches contradict the zero harm expectation in parts where residual risk and uncertainties are tolerated, such as in human health risk assessments, AHA processes or in ALARP systems.

- Attempts to eliminate 100% of risk from operations would be cost-prohibitive in many cases. Acceptable and unacceptable risks should be clearly defined and ways to achieve the standard of care should be established, designed and funded.

- As "the vision of zero harm is not about numbers, and is about a philosophy that no one should get hurt," one potential solution to the debate is to ensure that a high level of OSH care is provided to employees, subcontractors, the public and environment, focusing on control or avoidance of medium- to high-potential severity hazards no matter their probability.

- Other authors have concluded that setting zero as a target may seem logical, but that doing

so could harm an organization's safety efforts. It may have questionable effects on employee motivation; it may involve assumptions that are either wrong or unreliable; and it may prevent an organization from improving. **PS**

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