ANSI Z10: A Vision for the Future

Aaron Schoemaker  
Safety Manager, M.C. Dean

Chris Golden  
Program Manager, The City of New York

John T. Bennett  
Vice President, M.C. Dean

Michael A. Taubitz  
Senior Advisor, FDR Safety

Introduction

“Over time, Z10 will revolutionize the practice of safety,”

— Fred Manuel in *Advanced Safety Management*

The continued emergence of occupation health and safety management systems (OHSMS) in the occupational health and safety (OH&S) profession is evolving how organizations approach managing these processes to advance injury and illness prevention efforts. It is becoming increasingly common for organizations to promote conformity to various management system standards, and achieve considerable gains in performance by shifting away from traditional safety management approaches, to focus on speaking the language of business – risk. This risk-based systems approach is allowing OH&S professionals to provide greater value in the organizational hierarchy, equipping them with skills that better align OH&S processes into the overall business model. As we look at how our profession has evolved, regulatory compliance and enforcement is becoming less of a driving force in how OH&S is managed, while greater emphasis being placed on the reduction of risk to the organization overall.

The Z10 standard provides a vision for the future. Few people question the impact Z10 has had in advancing OH&S efforts in the United States. Z10 is effective in providing a risk-based approach to OH&S management, requiring Management Leadership (3.1) and—perhaps most importantly—Employee Participation (3.2) from all levels throughout an organization.

The following paper presents several “key takeaways” as to how organizations are using Z10 as a model for achieving considerable gains in OH&S performance, and embedding OHSMS elements throughout all functions of their overall business model. This paper specifically highlights how Z10 is driving emerging trends in the areas of risk assessment, prevention through design (PtD), and the alignment of OHSMS elements with emerging sustainability initiatives. Emphasis is placed on best management practices and innovative techniques being implemented to achieve results today.

Risk Assessment

Key Takeaway #1 – Transform from safety paralysis to operational risk analysis

“Predicting the future based on our knowledge and past experience is what OH&S professionals do...we look into the future and plan accordingly. We assess risk and identify the probability of serious outcomes. Then, based on our knowledge and understanding of the past, we predict the future to make accurate recommendations.”

— Former ASSE President Richard A. Pollack

The results of traditional approaches to incident prevention have stagnated over time. When speaking of traditional approaches, we are referring to emphasis on after-the-fact measures (lagging indicators), focus on trends of frequency and basic compliance. This is believed to create a paralysis – an inability of an organization to effectively increase OH&S performance to prevent incidents and reduce their associated costs. This paralysis results in an organization’s continued implementation of OH&S programs while expecting increased performance. Insanity.

However, this is changing. Leading organizations are beginning to shift away from traditional approaches to “safety” management in effort to operationalize risk management throughout all aspects of the organization’s business processes. The terminology and jargon of the OH&S profession is changing, too; migrating from “safety” and “compliance” towards “risk” and “mitigation.” Perhaps this is most evident with the American Society of Safety Engineers’ creation of the Risk Assessment Institute and the Risk Assessment Committee – established to advance the creation of resources for risk assessment-based program development. Risk assessment is a core focus of Z10. In fact, Z10’s Planning (4.0) section is nearly entirely devoted to it. This section requires Initial and Ongoing Review (4.1) of risks; their Assessment and Prioritization (4.2); and establishment of Objectives (4.3), Implementation Plans and Allocation of Resources (4.4) for their control.

One organization in particular has used Z10 as a roadmap to transform their traditional “safety” program into an Operational Risk Management (ORM) system by implementing an OHSMS conforming to Z10. M.C. Dean, Inc. is one of the nation’s premier electrical design-build and systems integrations firms for complex, mission-critical organizations. M.C. Dean has more than 3,500 professionals located throughout the United States, Europe, Middle East and various other locations abroad. This organization solely measured its safety performance by common injury and illness rates. “Half the national average,” was a
common boasting point that the organization used to market its safety efforts and accepted that performance as satisfactory. This traditional approach to safety management became inadequate when the organization was challenged by its CEO and executive management team to achieve truly world-class OH&S performance.

Tasked with meeting its CEO’s demand, the transformation process began. The road to Z10 conformance started with a corporate audit and assessment by top management of how M.C. Dean ranked when compared to Z10’s OHSMS conformance scorecard. The outcome was revealing in that the organization discovered it was merely managing issues; procedures were inadequately targeting regulatory compliance and when asked, “name one element of your safety program,” the organization’s operational staff stood silent. Through examining the organizations OH&S performance, the audit revealed that “major effort required, major or systemic non-conformance exist” and “significant non-conformances exist, still need focus.” Though the results of this assessment were less than desirable, the CEO stated the assessment “was the most accurate assessment that anyone has ever conducted.” The assessment’s conclusions quickly penetrated the operational segments of the organization and provided the motivation required to meet its CEO’s expectations.

As the implementation process began, the primary focus was placed upon critical elements of the standard. Z10’s Assessment and Prioritization (4.2) section was identified as the critical element that needed to be addressed first. As Fred Manuele stated in Advanced Safety Management, “the risk assessment requirements in Section 4.2 are highly significant. They are so noteworthy that three chapters pertaining to them directly follow.”

The method used for addressing Z10 conformance prioritized the identification and assessment of operational risk. Questions were asked of employees, such as, “what do we do as an organization?” There were varying answers with little consistency. It became evident that this organization had not identified all aspects of its operations, nor had it determined the extent of risk these operations posed to the organization. So an objective was established to perform a risk assessment for all operations, to be organized collectively in a risk register – a master index of risks for each definable feature of work. This assessment included identification of hazards and exposures, affected parties, probability and severity of potential occurrence, risk mitigation measures and controls, and the resulting residual risk. In addition to Z10, the guiding materials and tools used for assessing and prioritizing risks into the risk register were as follows:

- ANSI/ASSE Z690-2011 Risk Assessment Series
- ANSI/ASSE Z590.3–2011 Prevention through Design – Guidelines for Addressing Occupational Hazards and Risks in Design and Redesign Processes

The most critical element allowing this process to be effective was the extent of Employee Participation (3.2). The risk assessment process was executed through a series of workshops represented by employees from all functions located within the organization.

---

2 ANSI Z10-2005 Appendix J
3 Manuele, page 109
4 ANSI Z10-2012 Appendix E
including operations managers, project managers, superintendents, foreman and craft, engineers, facilities management, etc. The assessments were not safety department imposed; rather they evolved from a grass-roots effort that allowed employees to have direct involvement within the process. The results of this process allowed the employees to be exposed to new processes, ideas, and essentially a completely new way of thinking and doing business. The language throughout the organization began to shift. Employees were now provided control measures beyond personal protective equipment and began to think and plan accordingly down the preferred Hierarchy of Controls (5.1.1). This promoted superintendents and schedulers to build administrative control measures into a project’s schedule; engineers and detailers began to “design-out” hazards and reduce risk through elimination, substitution and engineering control strategies. Furthermore, the outcome of these engagements and development of the risk register allowed the organization to benchmark industry best management practices and apply them to their operations. Best management practices including, but not limited to:

- Prevention through design opportunities
- Prefabrication and modular construction techniques to reduce risk of injury and increase efficiency
- Application of the Construction Industry Institute’s Zero Incident Techniques
- Implementation of a “Daily Work Briefing” process

The risk management framework selected and implemented by the organization was Operational Risk Management (ORM), as defined by the Department of Defense’s Naval Facilities Engineering Command (NAVFAC) and the United States Army Corps of Engineers.

This risk assessment process has become a core value that has become instilled in the organization’s decision-making strategy. Every project proposal, major change within a department, production and scheduling activity, is evaluated through an assessment of risks, impacts to the organization and others, and controls to reduce likelihood and severity of a potential undesired outcome. The ORM process includes substantial Monitoring and Measurement (6.1) of its performance. On a regularly scheduled basis, project teams, department heads, and craft-level employees engage in audits in review of a specific operation’s risk register, to determine if any changes, deviations or incidents have occurred. This outcome of these audits results in Feedback to the Planning Process (6.5) in effort to continually improve the ORM process. As with any effective OHSMS, Management Review Process (7.1) is performed at regular intervals to validate OH&S performance. The result of implementing a Z10-based OHSMS and ORM process has achieved significant improvements in OH&S performance. The following are highlights of the results of this effort:

- Achieved acceptable risk levels achieved for various features of work – risk tolerance defined
- Accepted into AGC/OSHA Construction Health and Safety Excellence (CHASE) Partnership with “Blue Level” safety achievement
Selected to the accredited standards committee (Z10)
Selected as members of the ANSI Z690 Technical Advisory Group
Received ISO 9001 certification
Annual reduction in workers’ compensation costs by more than 50%
Annual reductions in incident frequency and Total Recordable Incident Rate
Annual reductions in experience modification rates

As M.C. Dean’s transformation process continues, the future presents tremendous opportunities to effectively engage employees in all operational functions to continually improved the ORM process. Advances in technology systems are being leveraged to identify any and every deviation from the control mechanisms programmed into the ORM process – allowing Corrective and Preventative Actions (6.4) to be executed quicker and prior to incident’s occurrence.

Using the application of software programs developed by M.C. Dean, operations, field and OH&S personnel are deploying the ORM process using and emerging tablet technologies to streamline the planning process and effectively guide at-risk employees through the ORM process in identification and management exposure to risks of tasks being performed. These technologies are also allowing for more efficient documentation and Monitoring and Measurement (6.1) of the ORM process. Moreover, greater access to planning and OHSMS documents can be provided through the application of QR code technologies, linked directly to OHSMS documents. These codes can easily be created and made available in the work environment to provide greater access to relevant information.

Key Takeaway #2 – What is not measurable, make measurable

“Our professional transformation has also seen us grow from safety enforcers to be avoided to in-demand collaborators who understand organizational challenges and needs. Operational leaders who own and are accountable for safety recognize that everyone is responsible for identifying and mitigating OH&S risk and making informed decisions.”

– ASSE President Kathy A. Seabrook

In its Responsibility and Authority (3.1.3) section, Z10 specifically requires organizations to integrate other business systems and processes into the OHSMS. It is often said that what gets measured, gets done. A shift in OH&S metrics is necessary to inform decision makers in what efforts are most effective in preventing injuries. Z10’s Monitoring and Measurement (6.1) section requires organizations to “establish and implement processes to monitor and evaluate hazards, risks, and their controls to assess OHSMS
performance. Z10’s *minimum* monitoring and measurement requirements include both leading and lagging indicators:

- Workplace inspections and testing
- Exposure assessment
- Injury, illness, and incident tracking
- Occupational health assessment

Again, these are Z10’s *minimum* requirements. Any aspect of an organization’s OHSMS that contributes to injury prevention, but goes unmeasured and unmonitored is a missed opportunity to feed information into the preventative action process. Simply collecting this data is not enough. Galileo famously stated, “count what is countable, measure what is measurable; what is not measureable, make measurable.”

It’s the interrelatedness of the aspects of an OHSMS that transforms programs into a system. Recognizing hazards of a particular operation can often drive an organization to revise a policy or procedure before an incident occurs. This is perhaps where advances in technology present the greatest value to OH&S professionals. Just as the interrelatedness of programs can lead to preventative action identification, the interrelatedness of OH&S metrics can take preventative action identification beyond simply identifying trends.

Most organizations look at indicators such “Total Recordable Incident Rate” and “Days Away, Restricted, and Work Transfer.” These rates—while important in the proper context—typically do not provide much value in informing decision makers as to what preventative measures are necessary in prevent reoccurrence of the next incident. Incident investigation is the most commonly used method for determining why an incident has occurred. Rarely does an incident have a single contributing factor or root cause. Incidents are often the result of multiple system failures that together compound the likelihood that an incident will occur (e.g., a hazard is not identified, an employee is not trained, a piece of equipment is not maintained, etc.)

One organization with more than $14 billion dollars in capital projects is leveraging technology to make information available to decisions makers in real-time to inform decision makers where best to apply preventative actions. With more than 250 projects, this organization is maximizing data collection opportunities through a significant software development process to move away from “paper” processes altogether. This is where the proliferation of tablet technologies is beginning to greatly affect how OH&S managers apply preventative actions through application of better-informed decisions.

“Big Data” has provided big demand for organizations to have as much data as possible—as quickly as possible—to make decisions in real-time. Data points for collection of OH&S information should be applied to the maximum extent reasonable. Tablet technologies allow for every hazard, near miss, audit observation, etc. to be collected, collated, and analyzed. The faster information can be obtained, the faster corrective and preventative actions can be applied. Aggregation and analysis of data not only provides organizations the ability to monitor OH&S risks, but also the ability to *model* OH&S risks. Both leading and lagging indicator data should feed into one another in creation of a
probabilistic decision model identifying where the organization is most at risk for their next system failure.

“Part of the appeal of decision models lies in their ability to make predictions, to compare those predictions with what actually happens, and then to evolve so as to make more accurate predictions.”5 Though they have their limits, decision models can provide tremendous value in overcoming biases that cloud judgment as to which efforts should be applied for preventing incidents. While this section has emphasized the importance of collection of OH&S data, the authors recognize the importance of a data set’s quality. Avoiding bias and maintaining accuracy of data is critical. As Fred Manuele wrote in Advanced Safety Management:

“A continual improvement process requires that measurement systems be in place to observe progress toward achieving stated goals…their purpose is to determine whether the processes are functioning as designed.”

This is where technology plays an equally important role in ensuring systems are not only effectively measured, but also implemented as designed. Workflows can be particularly useful in ensuring operations or projects do not proceed forward until OHSMS requirements are satisfied, or “closed.” The goal of implementing new technologies into the operational risk assessment process should be to eliminate the need for OH&S professionals to participate in the data collection process. For example, when front-line supervision takes on the role of performing inspections, instead of OH&S staff performing inspections, the opportunity for increased data collection is significant.

**Prevention through Design**

**Key Takeaway #3 – Prevention through design does not simply start, nor end with the design phase of a project**

With the release of ANSI/ASSE American National Standard *Prevention through Design: Guidelines for Addressing Occupations Hazards and Risks in the Design and Redesign Process*, the authors of this standard had Z10 in mind. From the Z590.3’s scope: “This standard provides guidance on including prevention through design concepts within an occupational health and safety management system.” A large capital delivery program responsible for the engineering and design of major infrastructure has taken an innovative approach to the way PtD principles are embedded throughout its project delivery operations.

To this organization, PtD previously meant “construct the project and then identify any safety issues before it was turned over.” This often didn’t occur until well after the project’s schedule roared past 90% completion. This resulted in a project delivery nightmare. Projects frequently required change orders to correct conditions that did not meet minimum regulatory requirements. This resulted is significant cost overruns; lawsuits over design errors and omissions; and the organization’s operations being negatively impacted with delays in turnover of equipment and operations. Something had to change.

---

5 From McKinsey Quarterly
The focus of OH&S management could no longer be placed solely on the operation of facilities, and a renewed emphasis was placed on embedding risk reduction principles throughout all aspects of project delivery – from project initiation, to project turnover. Just as it’s important to eliminate the likelihood of occurrence of a system failure in the execution of an operation or process, it’s important to eliminate the likelihood of occurrence of a system failure in the design of an operation or process. The same principles and techniques of an OSHMS that are used to prevent injuries and illnesses in a workplace should be employed in the design of a workplace.

Z10 provided the roadmap for this organization to embed the principles of PtD throughout its OHSMS and project delivery system; and this was not limited to Z10’s section titled Design Review and Management of Change (5.1.2). The goal for this organization was to apply the same OHSMS to the design of its workplaces, as it did for the operation of its workplaces.

This organization quickly realized that simply requiring the safe design of facilities by contract requirements with its designers was not an effective strategy for reducing risk to employees who ultimately had to operate and maintain the equipment and operations being turned over to them. Simply requiring the application of PtD principles in a request for proposals and expecting a design that effectively controls risks is like expecting an employee to never commit an unsafe act because a policy states a certain work practice is prohibited.

It was also evident that simply requiring design criteria—including regulatory requirements—in a checklist was not particularly effective in ensuring safe design principles were being incorporated into the project. Designers are not experts in OH&S regulations or best practices in safe design concepts. Though the organization had detailed design review checklists to account for minimum OH&S requirements, they were often
citing regulations that were not clear to most non-lawyers. This lead to the development of OH&S design guides that standardized designs of common design elements that exposed employees to harm (e.g., ladders, walking-working surfaces.)

What most differentiates Z10 from other management system standards is perhaps its requirement for Employee Participation (3.2), particularly by those who are “closest to the hazard.” But during the conceptual or design phase of a project, it is often the designer or project manager that is closest to the hazard, in theory – even if it is simply a concept or collection of drawings at the time, and not a physical exposure to harm.

Z10’s Hierarchy of Controls (5.1.1) is critical to an effective PtD program; risk reduction efforts must be formally evaluated and documented. Prior to using Z10 as model for PtD implementation, when unsafe conditions were corrected through the redesign process, a hierarchy of controls was an afterthought. Administrative controls and PPE was often selected, as they were typically the cheaper option to the project – without consideration given to the long-term use of what was being constructed. Considering risk reduction opportunities at the initiation of a project—sometimes even prior to the start of the design phase—increases the opportunities to select a more effective risk reduction strategy.

This organization also recognized a shift was necessary in the ways it trained its employees, too. Lecturing participants on regulatory requirements for safety was not effective for eliminating hazards during the design phase – instead, it was found to be extremely boring. Z10 specifically mentions the importance of Education, Training, Awareness, and Competence (5.2) of engineers in the safety design process. To ensure design professionals effectively understood the intent of the organization’s PtD program, hands-on demonstrations and “deep dives” were performed in a team-based environment facilitated by an OH&S professional to encourage discussion among design professionals as to how risks could best be reduced from their designs.

As a result of one of the authors of this paper trained more than 500 engineers, architects, and project managers on the importance of controlling OH&S risks in project management, it became abundantly clear that Prevention through Design does not start with, nor end with, the design phase of a project or process. Prevention through design is commonly associated with the performance of design reviews—typically at defined milestones during the course of the design phase of a project. However, the start of an effective prevention through design process should begin as soon as a project is conceived, not simply at the start of its design phase.

There is undoubtedly a need for design professionals to have a strong understanding of the principles of risk identification, evaluation and control – especially as it pertains to OH&S management. But OH&S professionals, too, should have an understanding of how
projects are managed within an organization and where PtD opportunities need to be embedded in the organizations project delivery system.

**Incident Investigation (6.2)** is a core function of any OHSMS. Through the identification of contributing factors and root cause(s) leading to an incident, formal evaluation should be undertaken to determine if the risk of unsafe conditions could have been reduced. It is common to share information from incident investigations in the form of “lessons learned.” Just as it’s important to share lessons learned with employees who are “closest to the hazard,” it’s important that lessons learned are shared with design professionals, too. Additionally, identification of lessons learned should not be limited to those lessons learned following incidents.

It is common for a design professional to not work for the organization that will ultimately execute or maintain the operation or process being designed. These individuals have less of a connection to the end-user of the design and are unlikely aware if someone is injured after the project is delivered. To implement an effective PtD program, designers must be aware of how incidents occur in the operation being designed. Past incident information and lessons learned from previous incidents and design errors must be communicated to designers.

**Sustainability**

**Key Takeaway #4 – Sustainability management is risk management**

OH&S professionals are taking on increasing responsibilities for the management of sustainability initiatives – specifically, the management of environmental and social impacts. Sustainability management, in many ways, is risk management. From resource constraints to the vulnerabilities of a changing climate, it is as critical as ever for an organization to be aware of their environmental and social impact. Standards are often necessary to guide organizations in managing an aspect of an operation where they lack technical or managerial expertise. Z10 assists organizations in taking a holistic approach to improving occupational health and safety performance.

Presently, a main driver for organizations’ desire to report sustainability performance is to encourage transparency and avoid negative publicity from not managing their environmental and social impacts. The Global Reporting Initiative (GRI) recently released its latest version of its *Sustainability Reporting Guidelines: Reporting Principles and Standard Disclosures*. Contained within these *Guidelines* are several standard disclosures of occupational health and safety performance. They are as follows:

- Percentage of total workforce represented in formal joint management-worker health and safety committees that help monitor and advise on occupational health and safety programs
- Type of injury and rates of injury, occupations diseases, lost days, and absenteeism, and total number of work-related fatalities, by region and gender
- Workers with high incidence or high risk of diseases related to their occupation
- Health and safety topics covered in formal agreements with trade unions
In GRI’s most recent Annual Report, it’s stated that “95% of the 250 biggest companies in the world report their sustainability performance, with 80% of these using the GRI Guidelines.” Many of these companies undoubtedly hold OH&S as a core value. However, less than 3% of GRI’s standard disclosures relate to OH&S performance. The previously outlined standard disclosures are weak, at best. What should be driving the scope of these standard disclosures are the fundamentals contained within Z10. Imagine instead organizations disclosed the following:

- The organization’s top management has established a documented OH&S policy
- The organization has established and implemented processes to ensure effective participation in the OHSMS by its employees at all levels of the organization
- The organization has implemented processes to monitor and evaluate hazards, risks and their controls to assess OHSMS performance
- The organization establishes and implements corrective action processes to address OHSMS deficiencies and inadequately controlled hazards
- Top management reviews OHSMS performance at least annually to recommend improvements to ensure its continued suitability, adequacy, and effectiveness.

Perhaps someone would counter with an opinion that these disclosures were developed for organizations of all sizes and scope, and not only those with world class OH&S management systems. But that’s the beauty of Z10; it too was developed for organizations of all sizes and scopes. Z10’s effectiveness is perhaps most derived from its simplicity. It’s these basic components of any OSHMS that should be common amongst organizations attempting to improve their OH&S performance.

Key Takeaway #5 – Developing sustainable behaviors through daily task planning

Engaging employees closest to the risk of undesired outcomes when integrating an OHSMS has its challenges. As previously mentioned Employee Participation (3.2) is a critical element of Z10. It is a requirement of the organization to involve its employees who are closest to the hazard within all aspects of its OHSMS. An effort that has proven to resonate well with front-line employees is the process of a daily work briefing. Daily Work Briefings or daily planning sessions is not a new concept, but unless these sessions incorporate some type of Feedback to the Planning Process (6.5) it is common for daily planning sessions to become a “pencil whipped” occurrence to fulfill some type of documentation requirement. This effort allows front line and craft-level employees to provide management with insight

---

6 From Global Reporting Initiative
as to the risks involved with a task that may have been overlooked during the risk identification process.

The key to effective **Employee Participation (3.2)** is the ability to create a consummate respect for people and continued recognition of the many variables of any process, activity or job task that exposes them to a safety and health risk. A technique that has proven effective in integrating a risk management framework into daily planning efforts is the use of white boards at the point of operation as a means to capture, display, and convey information. This provides a unique, engaging and “user-friendly” means for employees to identify and evaluate risk. This planning tool allows employees to collectively engage as a team, resulting in greater effectiveness in risk management techniques. This effort has not only proven effective for OH&S efforts, but has proven effective at evaluating production and quality risk as well.

**Conclusion**

“From the beginning of mankind, safety seems to have been an inherent human genetic element or force. The Babylonian Code of Hammurabi states that if a house falls on its occupants and kills them, then the builder shall be put to death. The Bible established a set of rules for eating certain foods, primarily because these foods were not always safe to eat given the sanitary conditions of the day. In 1943, the psychologist Abraham Maslow proposed a five-level hierarchy of basic human needs, and safety was number two on this list.”

– Clifton A. Ericson II. From *System Safety: What, Why, and How We Got There*

OH&S professionals have borne witness to an ever-changing profession that has increasingly advanced its mission to protect people from harm. But there is much room for improvement. To advance injury prevention efforts, organizations must continually evolve their OHSMSs to incorporate advances in technology and best management practices.

Though the OH&S profession has witnessed its fair share of trends, the focus areas discussed in this paper are anything but. The principles of risk management have been around centuries, and the benefits of integrating risk identification, evaluation and control with OH&S systems should be obvious. Though “PtD” as a formally researched and implemented concept gained most of its momentum in the two most recent decades, no one can argue that reduction of risk during the conceptual and design phases of a project or process makes little sense. Lastly, though the definition of sustainability is seemingly endless and ever-expanding, the concept of meeting today’s needs without compromising the ability of future generations to meet theirs will never fall out of style.

It’s up to OH&S professionals to continue the advancement of innovative approaches to injury prevention to protect our people and maintain their vision for the future. And today’s model for encouraging the development of those innovative approaches to injury prevention is Z10.
Bibliography


