**Session No. 689**

# ANSI Z10: A Model for Business Management Systems Integration

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## Introduction and Background Discussion

Times are changing rapidly. The emergence of managing risk has far more emphasis today than even five years ago. One has only to review the 2012 edition of the ANSI/AIHA Z10-2012 Occupational Health and Safety Management Systems standard and the ANSI/ASSE Z690.2-2011 Risk Management standard to recognize that the emphasis is shifting from safety to risk management. We'll examine the changes, advantages, and highlights of the new standards; however, we first must review the document and areas of emphasis in its historical context. We cannot afford to make the same errors made in the past. We must stop trying to force operational management into thinking "our way." Now is our opportunity to demonstrate a willingness to change.

More than forty years of work experience in the construction industry has provided me with a unique perspective on the subject of occupational health, safety and risk management. During the 1970's we were focused on regulatory compliance and enforcement. Those were difficult years. OSHA was the new kid on the block. A significant amount of management referred to the regulations as guidelines rather than regulations. A common response from safety practitioners was…"Sorry folks, it's the law!" Many rookie safety practitioners, including this author, stumbled forward thinking we were in control and enlightened.

In 1977 I was hired at a local nuclear power plant construction site after a stint in the U. S. Navy as a hospital corpsman. My mother went to church with one of the construction superintendents. After a superficial interview, he hired me. "You'll start Monday morning as a "Safety Inspector", he said. I found out real quick that my combat medic training didn't really qualify me for the job. Monday morning arrived and my supervisor handed me the thick OSHA regulations. "Read-up on these here regulations then go enforce 'em", he said.

I made a fool of myself trying to enforce regulations that I didn't understand in an unfamiliar industry. One of my favorite regulations at the time was the valve protection cap

requirement on compressed gas cylinders not in use. Every day, I "wrote-up" the superintendent of the shop because the cap was off a stored and upright cylinder. What I should have been concerned about was the ironworkers walking the steel 110 feet over my head without protection. As I look back, some of the circumstances were actually humorous, while others were quite deadly.

In the 1970's nuclear power had become the wave of the non-polluting future. Power industry owners pressed forward to license new plants. It seemed every week there was another serious incident involving multiple fatalities. Why? Because we were in a hurry…the plants had a production deadline. Management's mantra was "You people are holding us up," a common theme amongst management even to this day when discussing safety and/or quality.

By 1978 the nuclear power industry was on fast-forward. Then, on April 27th 1978 tragedy struck. The unfinished cooling tower at Willow Island collapsed killing fifty-one people.

A summary of the incident, developed by OSHA follows: The Occupational Safety and Health Administration (OSHA) investigation team arrived at the site the day of the accident. A team from the National Bureau of Standards (now called The National Institute of Standards and Technology or NIST), arrived two days later. Like most disasters, it's still hard to point to one specific triggering event. Instead, a mix of safety lapses combined to bring the tower crashing down:

- Scaffold was attached to concrete that hadn't had time to sufficiently cure.
- Bolts were missing and the existing bolts were of insufficient grade. See Bolted joint
- Only one access ladder, restricting ability to escape.
- An elaborate concrete hoisting system was modified without proper engineering review.
- Contractors were rushing to speed construction.

On June 8, 1978, OSHA cited Willow Island contractors for 10 willful and 10 serious violations. Among other things, the violations cited the failure to field-test concrete and properly anchor the scaffold system.

OSHA proposed $108,300 in fines. The cases settled for $85,500, or about $1,700 per worker killed in the disaster.

OSHA referred the case to the United States Department of Justice for a criminal investigation. A grand jury was convened, but no charges were ever filed."

It is interesting to note that the failure was the result of "a mix of ***safety lapses*** combining to bring the tower down." Really? The finger is pointed directly at failures in safety! Operational management and culture never entered into the discussion. Clearly the compartmentalized, discipline-based approach of that era ruled the day. They blamed the safety community, a notion today that is clearly absurd.

How many critical system failures had to occur to trigger this event? The bulleted summary above reveals clues to systems-integration failures, communication errors and business-language barriers. Today, the investigation seems quite shallow if compared to a modern

investigation using a sophisticated problem-solving methodology such as TapRooT, developed by Mark Paradies and Linda Unger of System Improvements, Inc.

Less than a year later on March 29th, 1979, the meltdown of reactor core number two at Three-Mile Island began. As they say… "The rest is history." The incident effectively shut down the nuclear power construction industry, which has only just recently resumed.

- But why did this incident occur?
- What common themes emerge from this operating incident versus the earlier construction incident?
- What did we learn?
- How have we applied what we have learned?

That was the 1970's. The 1980's yielded similar results. As the world became more sophisticated technologically, so did the severity and impact of the events. Challenger, Chernobyl, Bhopal, Valdez are common household names for all the wrong reasons. What repeatable operational and organizational management practices influenced the unfortunate outcomes?

While incidents were happening worldwide, safety professionals were busy counting "safety dollars" in an effort to incentivize safety. I myself threw everything I had into trying to obtain the elusive goal of 1,000,000 man hours without a lost-time accident. Overlooked were the hobbled employees that either got to work on crutches or were picked up from their home and carried to work. Who were we kidding? Corporate, the community, our competition, ourselves? Certainly the people weren't fooled.

In the 1990's, the carnage accelerated despite the fact that OSHA's Process Safety Management regulations (1910.119) placed new and significant elements of control in place to thwart operational errors. Is it possible to regulate your way to performance improvement? Winds of change were in the air as the discussion began to shift from regulatory compliance and enforcement. Management systems and behavioral safety processes began to move to the fore and provide a positive influence resulting in reduced operational errors and improved overall performance. The systems approach barreled forward. Sophisticated organizations implemented integrated operational business practices that produced results.

However, we must remain sober in acknowledging that the first decade of the new millennium has proved to be as costly as the previous decades. Despite utilizing the "systems integration" approach, organizational behavior is still the focus of investigations. After Chernobyl, the International Nuclear Safety Advisory Group (INSAG) released its landmark documents that focused on "safety culture" in operating nuclear facilities. INSAG rated the Chernobyl event a "level 7", which is the highest level on the International Nuclear Event scale. They studied every nuclear incident in the history of the industry. A common theme emerged from the multiple studies: every incident revealed a high tolerance for risk and a culture of production rather than safety. The industry apparently had developed an appetite for risk that proved intolerable.

The most recent event, which occurred at the Fukushima Nuclear Station in Japan after a 9.0 earthquake, confirmed that little operational change has occurred at this particular facility.

Tiffany Kaiser of Daily-Tech, an online blog, interviewed Tetsuo Iguchi, professor of quantum engineering at Nagoya University, after the Japanese Nuclear Regulatory Agency raised the event level from 5 to7. He stated that "The Chernobyl disaster occurred in 1986 when an explosion led to fire that released large amounts of radioactive particles into the atmosphere. This event was the only nuclear disaster in history to be rated a 7 on the International Nuclear Event Scale, but now, the Japanese nuclear regulatory agency has changed Japan's nuclear crisis from a 5 to a 7 on the scale as well."

"This is an admission by the Japanese government that the amount of radiation released into the environment has reached a new order of magnitude," Iguchi continued. "The fact that we have now confirmed the world's second-ever Level 7 accident will have huge consequences for the global nuclear industry. It shows that current safety standards are woefully inadequate."

Safety standards! Why did Iguchi point to the woeful safety standards? Why didn't he mention engineering, operational and management systems and standards as woeful?

Clearly, as a profession we must not only change the overall emphasis but the conversation. Iguchi strongly implies that the "blame" is in the lap of the safety community, effectively shifting the conversation away from the rightful owner.

Our profession has come a long way since the 70's. Now is the time for serious consideration of our approach to the subject. In the historical review we have seen evidence that a more intense effort must be asserted to connect the dots of systems thinking and systems management practice. In fact, perhaps a real overhaul in thinking is required.

The concept of "Systems Thinking", as defined by Peter Senge, prolific author and director of the Center of Organization Learning at MIT's Sloan School of Management, is this.

*"Systems Thinking" is a:*

- Discipline for seeing wholes and understanding how things influence one another within the whole.
- Framework for seeing interrelationships rather than things, for seeing patterns of change rather than static snapshots.
- Set of specific tools and techniques of feedback and the engineering theory to understand systems."

Learning to apply "systems thinking" to the business of operational management and see that every action or decision in operating, maintaining, and managing will result in a perceptible impact in improving the interrelationship among financial, environmental, and human resources. We can then evaluate the full circle of implications, not just those affecting safety and health. Failure of the practitioner to understand the business as a whole will eventually lead to career stagnation and repeated organizational errors and loss-producing events.

*Not applying the "Systems Thinking" approach will:*

- Result in decisions and actions that are made in isolation; decisions that are made in a void without determining the consequences to other systems.
- Result in poor or inefficient management systems; poor crisis management; and the wasting of energy and financial resources.

*Applying "Systems Thinking" approach:*

- Recognizes that all "systems" are influenced by the larger system in which it operates. In all cases, the "safety system" is influenced by the "operations and engineering systems"
- Questions all decisions and actions. Means and methods for providing operational management are established through investigations, feedback, and by establishing a partnership with all employees to achieve joint performance objectives.
- Develops an understanding and appreciation of global short-term and long-term consequences of any action or decision made.
- Focuses on cyclical rather than linear cause and effect.
- Problem-solves by viewing "problems" as parts of an overall system, rather than reacting to specific parts, outcomes or events, which only contributes to further development of unintended consequences.
- Creates system interfaces.

Moving forward, we will provide specific examples, practices and applications of systems-thinking utilizing ANSI Z10 as the platform for change. As we examine the mind-map below, imagine placing the 21 Z10 elements of control superimposed over the map and in various locations. As you visualize the map, rotate the elements of control and begin to visualize the opportunities to change the conversation as patterns of potential approaches and discussion emerge.

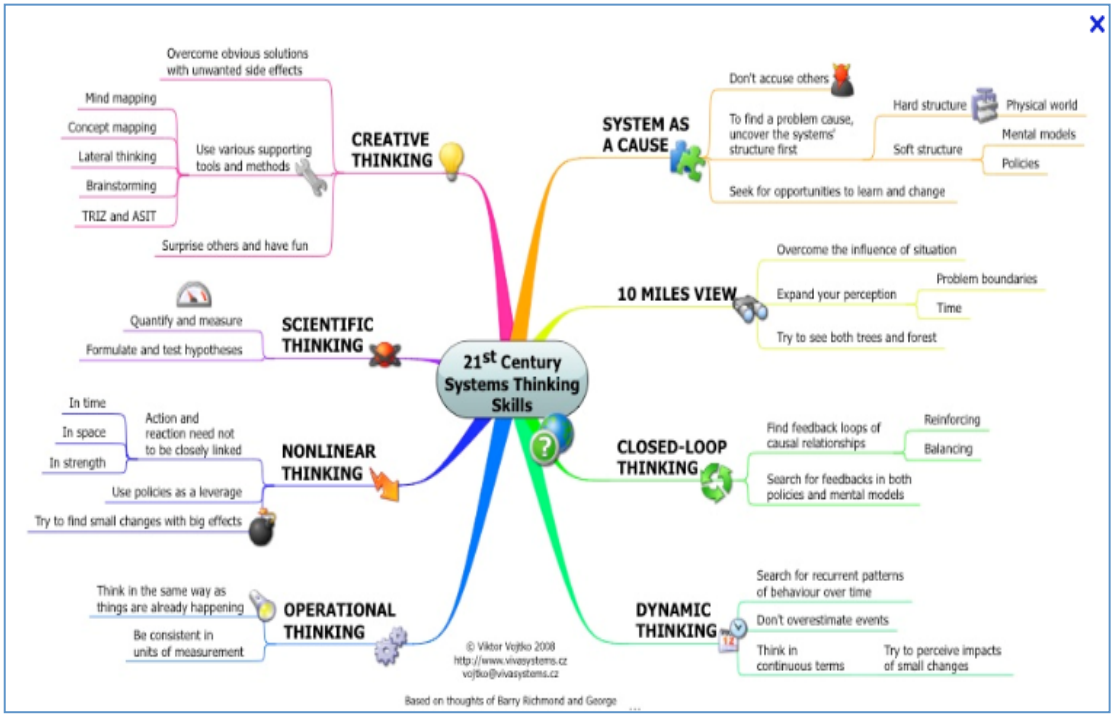


**Table 1: 21st Century Systems Thinking Mind-Map**

The 2012 Version of ANSI Z10 includes seven major sections. The focus of this document will be sections 3-7 with an emphasis on simplifying the message so that all levels of

management and employees can understand the system. Emphasis is placed on simplicity and the fewest amount of high-impact tasks or responsibilities as possible so as not to overwhelm or confuse the organization.

Special attention was placed upon changing the conversation in several areas including:

- Operational Risk Management versus Safety Program
- Risk Assessment versus Hazard analysis
- Focus on People rather than Regulations
- Abandonment of heavy regulatory compliance and enforcement
- Focus on building the company culture versus "safety program development"
- Simplification of the system and organizational expectations
- Expectation: Mr. Manager all we need is for you to master just 1 element of control versus a library of regulations etc…

M.C. Dean celebrated its 60th anniversary in 2009. Over the years, and especially in the past decade, the company has grown from its roots as a small regional organization in 1949 to the largest independent electrical design-build and systems integration firm for complex, mission critical organizations in the United States.

Safety performance over the previous decade had consistently hovered at about 50% below the United States Bureau of Labor Statistics (BLS)'s National Average recordable incident rate for electrical contractors. In 2007, the portfolio of work grew substantially as the Department of Defense awarded M.C. Dean a significant number of high-value contracts connected to the "Base Realignment and Closure" (BRAC) initiative. Around the same time M.C. Dean experienced tremendous growth in the private sector. As a result, the number of employees grew from several hundred to over three thousand. With this massive increase in revenue and manpower, the company was faced with many new challenges and opportunities for improvement.

Meanwhile, growth continued as did the frequency and severity of incidents. Senior management of the company became deeply concerned and hired additional professional safety resources to provide guidance and solutions to the occupational safety, health and environmental issues faced by the company. Mr. Dean's directive to the newly formed group was simple: evaluate and compare M.C. Dean's practices to the best in the world, determine the gaps and make the necessary adjustments.

Ultimately, the company chose ANSI Z-10 as the preferred guidance document to provide a framework for moving the program forward. The Z-10 Standard, according to John Bennett, Vice President of Safety, provided the appropriate level of specific Occupational, Safety and Health (OSH) element detail, guidance, and assessment tools to aid the company in its improvement efforts. This paper will recount the story of the process of assessing, developing, implementing and continuously improving the program within the context of the ISO/ANSI adoption of the Deming four-phase "Plan-Do-Check-Act" continuous improvement cycle.

## Phase 1 - The Assessment/Audit (Plan)

A team of internal stakeholders was assembled to conduct a detailed audit and analysis of existing company Occupational Health and Safety Management Systems (OHSMS) in accordance with the Z10-2005 Standard. The team utilized three major assessment path forward planning tools.

1. The audit protocols defined in Appendix I of the Standard provide guidance for the five major elements and corresponding sub-elements by examining the following objective and subjective evidence:
   - Documents
   - Records
   - Employee interviews
   - Organizational behavior
   - Employee observations

2. The OHSMS Conformance Scorecard was utilized and is featured in Appendix J of the Standard. The scorecard provides a five color coded qualitative assessment of the effectiveness of each OHSMS element. The color-coding method provides "at-a-glance" information to aid decision makers with an immediate calibration point relative to the level of OHSMS compliance for each element. In addition to the qualitative assessment a simple quantitative scoring approach was utilized through the application of points for each color code.

   The ratings are:

| Points | Color Code | Code Description/Maturity Level |
|---|---|---|
| 4 | Blue | World class occupational health and safety performance |
| 3 | Green | Strong. Conforming/complete, may have minor gaps in action plans |
| 2 | Yellow | Moderate. Scattered non-conformances need to be addressed, positive trends/major elements in place |
| 1 | Violet | Significant nonconformance exists, still needs focus |
| 0 | Red | Major effort required, major or systematic nonconformance exists |

**Table 2: Rating systems**

3. The third tool utilized was the S.M.A.R.T. (Specific, Measureable, and Realistic, Time-based) planning tool as exhibited in Appendix F of Z-10. The SMART tool enables organizations to approach findings and corrective action with a format focused upon the identification of clear, specific objectives that are measurable, action-oriented, realistic and time based.

M.C. Dean, utilizing the tools and techniques identified above, then embarked on a two-month journey from August 9th through October 2010 to evaluate the status of the company Safety, Health and Environmental (SHE) program. The focus of the audit was to determine the maturity level of the OHSMS, technical/regulatory and operation procedures and compliance, and overall safety culture. The following is a summary of the five major elements of Z-10, our findings, initial score and path forward plans.

*Element 3 - Management Leadership and Employee Participation*

*Initial Score: Violet – 1 point*
*Current Score: Green – Green 3*

| ANSI Version | Year | Points | Color Code | Code Description/Maturity Level |
|---|---|---|---|---|
| 2005 | 009 | 1 | Violet | Significant nonconformance exists, still needs focus |
| 2005 | 2010 | 2.5 | Yellow/Green | Moderate to strong improvement, some areas still need focus |
| 2005 | 2011 | 3 | Green | Strong conformance |
| 2012 | 2012 | 3 | Green | Strong conformance |

**Table 3: Element 3**

Summary of Findings

An in-depth review of both written and unwritten rules and internal policies and procedures revealed that a traditional command and control SHE structure was in place. Organizational and operational management had little to do with the safety process and viewed the department and personnel as the enforcement group responsible for compliance with external regulations. Roles and responsibilities were largely undefined and corporate policy indicated that the responsibility for implementation, enforcement and ongoing maintenance of the program was the responsibility of the Safety Director.

The audit team looked for elements of employee participation and involvement but was unable to identify specific activities that indicated the existence of a structured process. Involvement was sporadic and varied from project to project.

Overall, the auditors determined that the company had a traditional reactive safety department-driven program versus a management-driven process.

SMART Plan:

- Clearly define the roles and responsibilities of each level of management including executive, senior, operational and field level supervision. Shift emphasis from reactive to proactive.
- Redefine the corporate OHSMS policy to shift performance responsibility to operational management and establish a collaborative environment where employee participation and involvement result in a culture of continuous improvement.
- Conduct educational sessions with management and employees to discuss the vision and cultural adjustments required for improved performance in the 21st century.

*Element 4 – Planning*
*Initial Score: Red – 0 Points*
*Current Score Green 3 points*

| ANSI Version | Year | Points | Color Code | Code Description/Maturity Level |
|---|---|---|---|---|
| 2005 | 2009 | 0 | Red | Major effort required, major or systemic non- |

| | | | | |
|---|---|---|---|---|
| | | | | conformance exists |
| 2005 | 2010 | 2.5 | Yellow/Green | Moderate to strong improvement, some areas still need focus |
| 2005 | 2011 | 3 | Green | Strong conformance |
| 2012 | 2012 | 3 | Green | Strong conformance |

**Table 4: Planning**

## Summary of Findings

Opportunities for improvement in the planning element existed. Within the context of the Z-10 standard the company did not have a structured process to evaluate work tasks or prioritize hazardous work activities. Practices related to the development of short and long-term objectives and goals were absent. Strategic initiatives and short term tactical activities to produce safe outcomes on a daily basis were inadequate. This element provided the company with the best opportunity for immediate improvement and over time proved to be a critical gap that was filled with a structured planning process that was updated every day by employees engaged in the work activities.

## SMART Plan

- Adopt and implement the Naval Facilities Command – "Operational Risk Management" (ORM) process that is a method to identify risks/hazards associated with each work task and then implement controls to reduce the risks from people, the operation and the environment. Simplify the process to ensure each party clearly understands each function and element of control.
- Adopt the risk register concept from the Australian Risk Management standards to assist in the categorization, prioritization and implementation of the appropriate hierarchy of control to accommodate the work process safely. Involve workers to ensure adequacy of the final product.
- Adopt the United States Army Corps of Engineers methodology for assessing and controlling hazards for each work activity and for each work position. The Activity Hazard Analysis (AHA) is an administrative control that helps to identify hazards associated with each step of a definable feature of work. The Position Hazard Analysis (PHA) is an administrative tool that identifies the physical hazards, chemical hazards, skills, tools, material, equipment, training and certification requirements associated with a position (such as electrician),
- Implement the "Daily Work Briefing" process that requires each work group to meet each day prior to beginning work to discuss the scope of work for the day and to identify hazards and appropriate control measures. Daily work briefings are also reconvened whenever the work task changes.
- Implement routine management ORM field inspection requirements to demonstrate management commitment to the process.
- Implement weekly review of upcoming scheduled activities to reduce work interruptions.
- Implement a weekly, monthly and annual review process. (See evaluation and corrective action)
- Engage employees in all planning activities.
- Conduct educational sessions to explain the ORM process (including its five core functions and six elements of control) and define roles and expectations.
- Adopt and implement the Construction Industry Institute (CII) Zero Incident Techniques.

*Element 5 – Implementation and Operation*
*Initial Score: Violet – 1 point*
*Current score Green – 3 points*

| ANSI Version | Year | Points | Color Code | Code Description/Maturity Level |
|---|---|---|---|---|
| 2005 | 009 | 1 | Violet | Significant nonconformance exists, still needs focus |
| 2005 | 2010 | 2.5 | Yellow/Green | Moderate to strong improvement, some areas still need focus |
| 2005 | 2011 | 3 | Green | Strong conformance |
| 2012 | 2012 | 3 | Green | Strong conformance |

**Table 5: Implementation and Operation**

Summary of Findings

Significant opportunities for improvement were identified as gaps relating to all elements of implementation and operation elements of control were identified. The Z-10 hierarchy of controls methodology was a new concept to the organization as personal protective equipment was identified as the first line of defense rather than other elements of the hazard control hierarchy. As an engineering firm it was realized that prevention opportunities presented during the design-phase of the work. Subcontractor controls were implemented to protect the company and improve their performance as well. Emergency preparedness plans required updating. Educational programs which explained the standard and newly developed programs and process were developed to close the knowledge gap. Routine communications regarding safety performance was weak. Document controls and recordkeeping were determined to be inadequate.

SMART Plan:

- Implement a process to identify each work activity and apply associated controls.
- Implement a management of change process and apply to design services, changes in supply chain management, changing codes and standards and other critical areas of the operation.
- Develop a procurement procedure to establish safety, health and environmental issues associated with purchased products.
- Develop and implement contractor pre-qualification standards, orientation programs and specific work activity safety, health and environmental control requirements and contract specifications.
- Upgrade and implement emergency preparedness procedures.
- Modify and upgrade current training and awareness program to include how to nurture a safety culture, operational risk management, and issues that stretch beyond regulatory compliance.
- Develop and implement a means to communicate SHE issues, performance results and recognition to the entire organization.
- Establish, implement and maintain an ISO 9001 recordkeeping and procedure development process and review cycle.

*Element 6 – Evaluation and Corrective Action*
*Initial Score: Violet – 1 point*
*Current score Green -3 points*

| ANSI Version | Year | Points | Color Code | Code Description/Maturity Level |
|---|---|---|---|---|
| 2005 | 009 | 1 | Violet | Significant nonconformance exists, still needs focus |
| 2005 | 2010 | 2.5 | Yellow/Green | Moderate to strong improvement, some areas still need focus |
| 2005 | 2011 | 3 | Green | Strong conformance |
| 2012 | 2012 | 3 | Green | Strong conformance |

**Table 6: Evaluation and Corrective Action**

Summary of Findings

The audit revealed that some structure was in place to monitor activities. An online safety management database system was and allowed for the capture of information relative to employee behavioral observations and had the capability of being expanded to accommodate regulatory inspections and OHSMS audits. However, the data was not being utilized to the extent possible. Incident investigations were being conducted, but the reports were rudimentary and based upon the gathering of insurance type information rather than an examination of root causes or contributing factors related to system failure. Focus of investigations generally pointed to an error of immediate cause, i.e. employee carelessness. Management system audits were not conducted to evaluate alignment with a system-based approach. Corrective actions were taken at projects but not recorded well. Processes to capture feedback for performance improvement purposes were not in place.

SMART Plan

- Expand the analysis and evaluation capabilities of the online safety management database.
- Develop a weekly and monthly analysis of captured information and distribute to stakeholders for continuous improvement efforts/
- Develop an online self assessment scorecard to track leading indicators such as training, management and employee participation, compliance with OHS program activities, and lagging trends such as recordable and DART rates. Distribute to stakeholders monthly.
- Expand the incident investigation process to include a review of potential system deficiencies, key elements of control, and contributing cause factors. Involve management and employees.
- Develop and implement a "lessons learned" process.
- Develop audit protocols to assess OHSMS maturity levels based upon the 21 elements of Z-10. Repeat annually until all elements are scored in the green range and trending toward blue. Thereafter, conduct the audit bi-annually (or more often if conditions warrant). Communicate audit results to appropriate parties for review and corrective actions as required.

*Element 7 – Management Review Process*
*Initial score: Violet – 1 point*
*Current score Green – 3 points*

| ANSI Version | Year | Points | Color Code | Code Description/Maturity Level |
|---|---|---|---|---|
| 2005 | 009 | 1 | Violet | Significant nonconformance exists, still needs focus |
| 2005 | 2010 | 3 | Green | Moderate to strong improvement, some areas still need focus |
| 2005 | 2011 | 3 | Green | Strong conformance |
| 2012 | 2012 | 3 | Green | Strong conformance |

**Table 7: Management Review Process**

Summary of Findings

Some evidence of a management review process was identified. However the focus of the review was primarily financial, with some OHSMS goals and objectives outlined. Significant critical elements of review were missing including strategic long-term programmatic issues, short-term tactical controls, and specific targeted areas for reduction of incidents, identification of major risks, policy improvements/adjustments, and resource requirements.

- SMART Plan: Establish a team of internal stakeholders to evaluate and steer the OHS program.
- Develop an annual review of program elements, results and progress to determine path forward goals and objectives.

Phase 2 – The Implementation (Do)

The initial implementation of the Z-10 OHSMS began in December 2009 and was completed in late February 2010 for all projects in the Engineering and Construction division of the company. Construction represents more than 70% of the bulk of M. C. Dean business and presents with the highest risk profile. Special emphasis was placed upon a simple, easy to understand, daily planning process that included management and employees.

As the implementation process began, project teams focused on the elements of control featured in the SMART Plan contained in the review of Element 2 (discussed above in Phase 1). An employee suggestion to place the Organizational Risk Management (ORM) symbol on a white board to guide employee teams in the daily work briefing caught fire as each work crew at every project began the practice. Within weeks the white boards began popping up at project locations world-wide. The phenomena of the dramatic change in this simple workplace safety practice stimulated a change in the culture that was clearly visible within weeks of the implementation.

Excitement for the process spread as employees began to realize that their ideas, concerns and issues were being resolved in a timely manner. Employee involvement in the development of risk registers, activity hazard analyses, and position hazard analyses created awareness among the work force and resulted in immediate reductions in incidents and accidents world-wide. Employees began looking after each other's well-being, rather than watching an incident occur and also began communicating and resolving safety issues on their own. The traditional

enforcement and compliance approach was abandoned for a more collaborative system that focused on people rather than regulations.

Management involvement increased as teams began to clearly understand the mission and teamwork improvements were evident. Traditional "us versus them" barriers were quickly broken down as communication improved and better performance followed. This level of improvement continued throughout 2010.

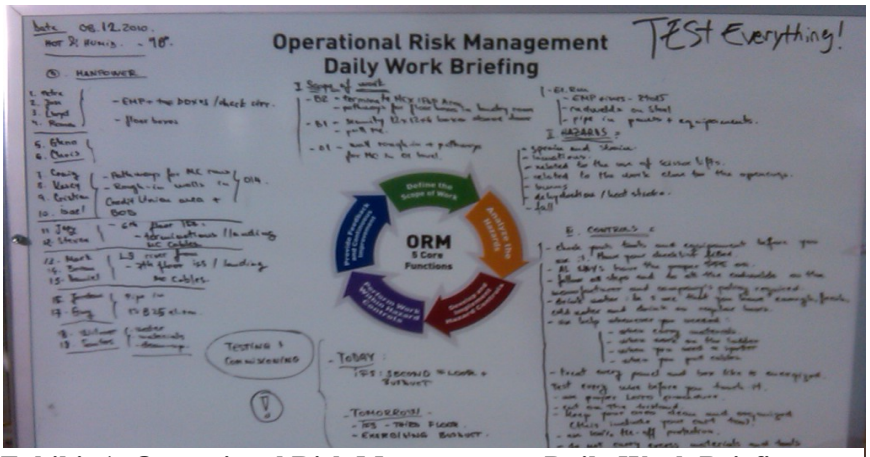


**Exhibit 1: Operational Risk Management - Daily Work Briefing**

By the end of 2010, the number of incidents reduced as well as their frequency and severity. Although recordable incidents reduced by a modest 15%, workers' compensation costs were reduced by over 57%, a savings of over $1.2 million dollars, despite working 1.1 million additional hours.

Additional program adjustments were made as audits and feedback indicated several areas, which should be targeted and implemented for improvements in 2011.

As the OHSMS began to mature, safety performance continued to improve. Adjustments to practices, procedures, and auditing protocols were implemented. External customers, suppliers, clients and regulators noticed improvement and were inquisitive about the white boards that displayed the ORM symbol and contained notes from the Daily Work Briefings. Interest continued as members of the ANSI Z-10 committee visited our sites and began to ask questions about the M.C. Dean Z-10 process. The culmination of progress occurred in April 2011, when ANSI selected M. C. Dean to become members of the accredited standards committee. Members of the M. C. Dean safety department assisted with the development of the second edition of the ANSI standard, scheduled for release in the summer of 2012.

Meanwhile, we closed out 2011 with a 37% reduction in recordable incidents for a recordable incident rate of 1.33. Workers' compensation reductions followed as costs were reduced by another 60% from the previous year.

Improvement plans for 2012 include a reduction of incidents by another 50%. Written program adjustments are planned to align with modifications to the second edition of ANSI. Continued reductions in workers' compensation costs should follow.

## Phase 3 – Checking the Plan

As with many programs, what gets measured gets done. Implementation of a Z10 program provides many opportunities for data collection and metric. The more meaningful the data

presents the more impact to the organization. In the case of our implementation, we chose to create a Mind Map of each of the 21 elements comprising the Z10 standard, linking our policy, procedures, and artifacts to each element. When completed, the MAP provides the ability to:

1. Audit the process in either direction
2. Provides for a visual reference of implementation
3. Allows for color coding of elements and sub-elements indicating for further guidance

MC DEAN 60th anniversary 1945 – 2005

Corporate Audit
Self-Audit
Third Party

**ORM Program Assessment**

**Site Name:** **Date of Audit:**

Auditor:

| | 1.0 Administration/Training | Input | Comments | Score |
|---|---|---|---|---|
| 1 | ORM Being Conducted and Documented | Yes | Available in binders at the safety office | 100% |
| 2 | Does the project site document ORM training in employees' training records (paper or electronic)? | Yes | paper copies available | 100% |
| 3 | Records for the ORM process are being maintained | Yes | DWB, PHA, Risk Assessment, Site Orientation, APP | 100% |
| 4 | All Employees Attend Orientation | Yes | Site orientation developed and all attended | 100% |
| 5 | Superintendent speaks to all employees as part of site orientation | Yes | Florian is present and speaks of the importance of safety | 100% |
| | **2.0 Activity Hazard Analysis, (AHA) Process** | **Input** | **Comments** | **Score** |
| 1 | AHA are developed for each task | Yes | | 100% |
| 2 | AHA are being reviewed before the start of each new job task by foreman/supervisor with employees. Follow-up reviews will be conducted on a weekly basis as a minimum | Yes | AHA are part of the DWB | 100% |
| 3 | AHA is being developed with input from employees | 80% | Comments to the AHA will be inputed as they are received | 80% |
| 4 | AHA is readily available to all employees | | Copies of all AHAs are separated and printed for convenience | |
| | **3.0 Project Risk Assessment Register** | **Input** | **Comments** | **Score** |

**Exhibit 2: ORM Assessment**

At project locations checking the plan consists of an audit in 8 categories. They range from paper process that is documented and implemented in the field, to supervisory engagement. Internal auditors conduct a 360 on a project that will include employee interviews of their performance, their supervisory staff performance, and the engagement from management to employee. In the past, management commitment was difficult to gauge, it can now be quantified and included in a monthly assessment to executive management.

Corporate 360 audits use employee's peers to assist in the evaluation of the project.

It allows for a fair assessment of the project data and areas where we may all improve upon. It also helps other projects, as they immediately use the findings to improve on their respective sites. The sense of healthy competition drives better results

## Phase 4 - Acting upon Findings

The ability for us to use our leading metric provides for increase safety on projects, involvement of craft workers completing a risk assessment and implementing controls. The program is simple to use and easy to implement. The results we have experience are positive. As information is received, it can be easily analyzed, identified and resolved through our leading indicators making MC Dean's safety program even stronger.

The path forward for M.C. Dean involves digitizing the process to streamline and reduce paperwork. The Company is also very committed to paper and waste reduction in its effort to become LEED certified and ISO compliant. Such a move would not only consolidate the current formalized management system but also increase productivity.

M.C. Dean's approach to safety, health and environmental management shows that unlike other companies where safety is a standard formula calculation…all it takes is a simple question

"if an incident were to occur …where would it occur today?" to reduce accidents and incidents and build strong interpersonal relationship.

Results

Three years after implementation the workers compensation direct cost have been reduced by over 80% and incidents by 60%.

## Risk Assessment Introduction

Remember that all "systems" are influenced by the larger "system." If we think of an integrated management system as the vehicle that drives continuous improvement, we can think of risk assessment as the engine or system that powers the vehicle. In this case, it is not so much what we do but "how" and "why." ANSI Z10 is based upon the proven Plan-Do-Check-Act model often attributed to Dr. W. Edwards Deming. Deming taught that systems should be simple and designed for all workers to contribute to continuous improvement. It is with this foundation that we will explore how **Ta**sk **B**ased **R**isk **A**ssessment (TaBRA) is a risk assessment tool that addresses both the "how" and the "why."

Task Based Risk Assessment (TaBRA) was developed by General Motors and the United Auto Workers to identity routine tool changes and other minor servicing activities that could be performed using control reliable energy control systems in lieu of lockout. GM's control reliable systems are called Monitored Power Systems or MPS. The TaBRA methodology was recognized in OSHA's December 16, 1999 letter to Mr. Tom Weekley, then Assistant Director, UAW General Motors Department. OSHA's letter, states, in part…

*"However, an MPS which meets the above referenced ANSI consensus standards on control reliability and control component failure protection (ANSI B 11), would provide alternative safeguarding measures, which constitute effective employee protection. Thus, such an MPS may be used to protect employees who are performing minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, provided that each element of the §1910.147(a)(2)(ii) exception is met. In other words, the MPS system may be used in cases in which minor tool changes and adjustments, and other minor servicing activities, are performed during normal production operations, and are routine, repetitive, and integral to the use of the equipment for production. It is important, as you have stated, to apply this safeguarding technique (MPS) through a hazard analysis process (TaBRA) on a case-by-case basis in order to assure that it, in fact, provides effective employee protection…. "*

See http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=22838. Task Based Risk Assessment was subsequently incorporated into the ANSI B11 family of general industry machine safety standards.

## Understanding TaBRA

Task based risk assessment is a method that asks a worker / subject matter expert to share his / her accumulated experiential learning to identify and mitigate hazards. This is what aligns TaBRA with Deming and the philosophy of ANSI Z10. It is respectful of the worker and is

simple enough that supervisors and workers can immediately learn how to do the process. It should always be performed where the work is actually done.

In most cases, a small team may work through the process. TaBRA has several differences and advantages compared with a traditional JSA or job safety analysis:

## Employee Input

- Employees / other subject matter experts are familiar and comfortable talking about the details of their work (e.g. operator, maintenance, material handling, etc…) and tend to "open up" providing detail not found with other methods.
- The process produces more information than observation or a traditional JSA (job safety analysis.) We often refer to this extra detail as "granularity."
    - If something goes wrong during the task (e.g. parts or tools dropped), discussion may disclose a potentially serious hazard with high risk. In situations where risk is low, identification of the problem allows possible elimination of the operational waste to improve efficiency.
- Risk estimation comes with strong input from workers / experts who are familiar with the task, facilitating the best estimate of risk

## When to Use TaBRA

- TaBRA is not for every job. It should be used where there are questions about whether hazards exist and their potential for injury.
    - The tool is excellent for high risk jobs and situations where there are questions about the appropriate level of safeguarding – or where improvements in performing the task are desired
- Risk assessment should complement traditional JSAs and standardized work instructions
- Depending upon the level of task complexity, these assessments may take one to two hours.

## More on How and Why

- The process recognizes several important factors:
    - Zero risk does not exist
    - Safeguarding must recognize the realities of the real world, for example:
        - Power may be required
        - Work may have to be performed at elevation or in a confined space
        - Operator intervention may be required during machine / process operation
- The initial assessment is performed on a "naked machine or operation."
    - Existing safeguarding is not considered in assessing risk at this stage – only after feasible risk reduction.
- For each step, hazards are married to that element of the task, creating what is commonly referred to as 'task-hazard pairs.'
- The matrix allows participants to choose the probable severity of harm. When married with the probability of occurrence, the matrix identifies the risk level as:
    - High
    - Medium
    - Low
    - Negligible

| PROBABILITY OF OCCURRENCE | SEVERITY OF HARM | | | |
|---|---|---|---|---|
| | Catastrophic | Serious | Moderate | Minor |
| Very Likely | High | High | High | Medium |
| Likely | High | High | Medium | Low |
| Unlikely | Medium | Medium | Low | Negligible |
| Remote | Low | Low | Negligible | Negligible |

**Table 8: Severity of Harm**

Severity

- Catastrophic: Death, system loss, or irreversible environmental damage;
- Serious: Occupational illness, major system damage, or reversible severe environmental damage
- Moderate: Injury requiring medical attention, illness, system damage, or readily mitigated environmental damage
- Minor: Injury, minor system damage, or minimal environmental damage.

Probability of Occurrence

- Very Likely: Expected to occur frequently
- Likely: Will occur several times in the life of an item
- Unlikely: Possible to occur in the life of an item
- Remote: So unlikely, it can be assumed occurrence may not be experienced

Feasible Risk Reduction

- The goal is to perform risk reduction on task-hazard pairs that are 'high' or 'medium' risk with the goal of reducing them to 'low' or 'negligible'
- The Hierarchy of Controls is the preferred approach to mitigating risk. This hierarchy, described in Clause 5.12. of ANSI Z10, allows the team to identify suitable risk reduction for task-hazard pairs that need remediation.

Benefits of TaBRA

- Identifies where lockout is required vs. energy control
- Enables collaborative discussion with workers and other knowledge experts, offering a method / process for being "the voice of the factory/working floor."
    - Improves employee relations because workers know they are being listened to – and their work is being assessed – not criticized.
- Facilitates decisions for selection of appropriate safeguarding, including lower order controls
    - Gets management out of the 'do-loop' sometimes posed by 'what if' being used without the discipline of documented risk assessment
- Helps with prioritization of risk

- Excellent tool for the integration of lean (improvement in operational performance) and safety
    - Reduces risk to an acceptable level while minimizing waste
- Provides both safety and compliance

Case Study

Following a recent pilot project for a manufacturing client, top management agreed to further explore the use of TaBRA as the plant's common methodology for driving continuous improvement in safety, quality and process improvement. The reason for this decision was the granularity that opened eyes to issues not previously recognized. In a finishing operation:

- The plant's excellent JSA documents highlighted 3 steps for setting up the machine to run. (remember, JSA is typically applied for hazards and risk, not all operational steps)
- An experienced worker guessed that the work would be 6 steps.
- TaBRA showed 17 steps.

As the worker told the CEO, "I take for granted all the things I'm doing."

So do we all… Invariably, TaBRA will show 3-4 times as many steps compared with an experienced worker's estimate. The old adage, "the devil is in the detail" applies here. If we overlook steps, we can realize:

- Unrecognized hazard potential
- Unrecognized quality issues
- Opportunity to reduce operational waste
- Poor training standards for new employees

## Summary

TaBRA is a simple and proven methodology for any organization wishing to integrate safety into the core business. Check out ANSI Z10 and ANSI B11 for more information for a methodology that can reduce risk, improve perception of workers and make things run well.

## Conclusion

Clearly, for many companies, changing the emphasis from safety to organizational and operational systems improvement is much more successful when applied rather than trying to inject a "safety program" into an operation. Keep these tips in mind when attempting to significantly change or improve the performance of an organization.

- Recognizes that all "systems" are influenced by the larger system in which it operates. In all cases, the "safety system" is influenced by the "operations and engineering systems"
- Is performance oriented and questions all decisions and actions. The means and methods for providing operational management are established through investigations, feedback, and by establishing a partnership with all employees to achieve joint performance objectives.

- Develops an understanding and appreciation of global short-term and long-term consequences of any action or decision to be made.
- Focuses on cyclical rather than linear cause and effect.
- Problem solves by viewing "problems" as parts of an overall system, rather than reacting to specific part, outcomes or events and potentially contributing to further development of unintended consequences.
- Results in an integrated approach that creates system interfaces.
- Utilizes existing operational language rather than confusing safety acronyms.

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