

Operational Risk Management: A Model for Business Management Systems Integration

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Description of the Safety Management Innovation Award

This document will serve to describe the worldwide implementation of an integrated occupational safety and health management system based upon ANSI Z-10, ANSI Z-690 and the U.S. Department of Navy Operational Risk Management Processes. The complexity of the implementation includes manufacturing facilities, various classified operations, operations and maintenance contracts, and electrical design-build and systems integration for complex, mission-critical organizations for 3500+ employees at hundreds of locations.

The focus and success of the innovation hinged upon an approach that was distinctly different than the traditional safety/regulatory compliance approach. We chose to implement a strategic long term, process based, employee driven integrated system led by management utilizing the above noted standards. We simplified a complex set of regulations and standards, at the suggestion of an employee, to create an atmosphere of confidence in the system rather than confusion. We condensed the major elements of our system to a symbol that represents the 5 core functions of operational risk management and 6 elements of control (3 strategic, 3 tactical) all of which fits onto a business card. The Daily Work Briefing proved to be effective which resulted in extending the discussion to solving quality and production issues. Later, the company recognized the benefits of the system and has initiated implementation across all disciplines. In 2010, M.C. Dean eroded roughly \$112 million in revenue from direct and indirect losses. In 2013, that number was reduced to \$32 million which represents a savings of \$80 million. \$80 million revenue dollars have been capitalized into profit versus being lost to direct or indirect costs of incidents (refer to enclosed Advanced Risk Management Business Metrics).

M. C. Dean and its employees have benefited in several areas from the result of the Operational Risk Management Process. These include:

- Engaged and educated employees that are now able to identify any project risks and implement controls as a natural way of doing business (i.e. Risk Management vs. Regulatory Compliance).
- A keen understanding of identifying overall risk, human risk and activity risk using specialized assessment methods.
- The ORM Daily Work Briefing Board served as an outward billboard demonstrating our commitment to safety. Customers, suppliers and state agencies began asking us for help. For example, NC DOT implemented the ORM process with our assistance. At least 5 General contractors have adopted the system with success. Calls for assistance are routine.
- The abandonment of heavy regulatory compliance and enforcement led to an empowered cooperative workforce where innovation and good ideas took priority over fear and intimidation at all levels. The results speak for themselves.
- Lagging indicators (i.e. 60% reductions in injuries and 75% reduction in WC costs) could be the story. However, the intent of this paper and our program is to illustrate the antithesis.

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 world-wide, safety professionals were busy counting “safety dollars” in an effort to incentivize safety. I 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 to 7. 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.

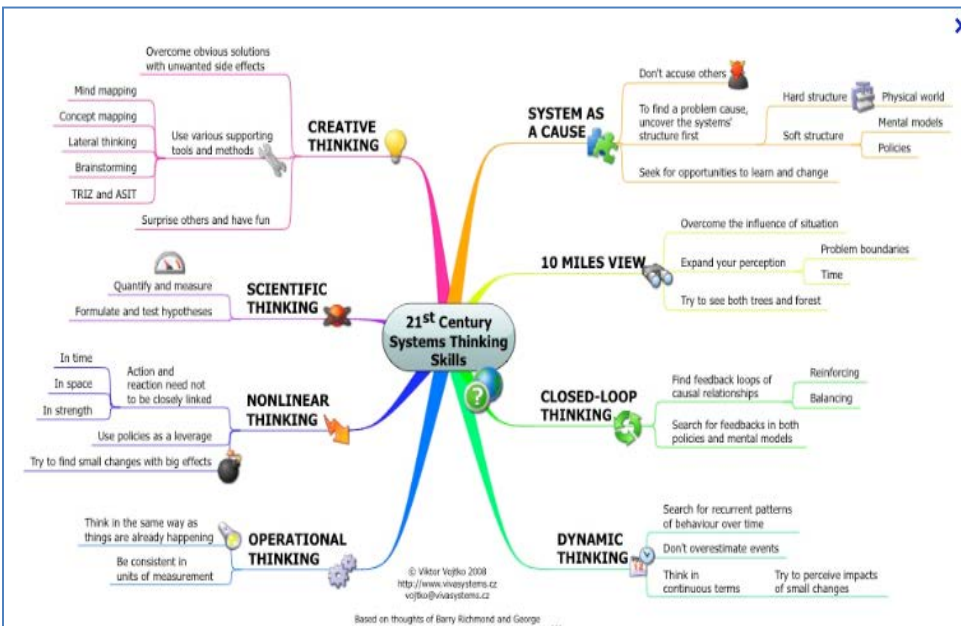


Table 1: 21st Century Systems Thinking Mind-Map

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

- 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

- 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 which 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

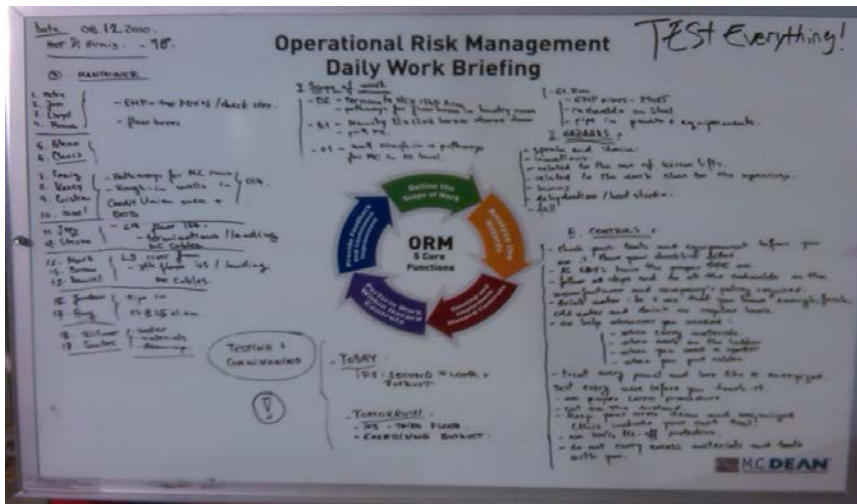
Some evidence of a management review process was identified. However the focus of the review was primarily financial, with some OHSMS goals and objectives outlined. Significant critical elements of review were missing including strategic long-term programmatic issues, short-term tactical controls, and 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 worldwide. The phenomena of

Exhibit 1: Operational Risk Management - Daily Work Briefing

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.

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

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 is

1.0 Administration/Training		Input	Comments	Score
1	ORM Being Conducted and Documented	Yes	A-vailable 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	80%	Comments to the AHA will be inputted as they are received	80%

now able to 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

Exhibit 2: ORM Program Assessment

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

I'd like to refer back to the "our way" of thinking when discussing our performance remembering that "our way" describes traditional safety management measurements. We've had great success with our lagging indicators at M.C. Dean. Three years after implementation the workers compensation direct cost have been reduced by over 75% and incidents by 60%. Our severity rates are the lowest they've been in recent history and we are often recognized by our customers as being best in class. We are proud of these accomplishments; however, we hadn't found a way to connect to our internal customers with "our way" within the context of managing and measuring safety. We reinvented the way we measured our processes and the innovation allowed us to connect to and improve our business relationships.

I don't want to suggest that our executive managers didn't understand or recognize that safety performance was good because they were all satisfied and even started to sell safety in some cases. We recognized that safety when reported from a financial perspective provided the impetus for management understanding and response. The conversion to financial measurements provided the bridge that connected the risk management staff to the operations staff.

Financial Metrics

The first metric developed was a cost of revenue. We reviewed losses and created a metric that illustrated to each division manager the negative impact of incidents against their revenue. We reviewed the new metric with an Executive Vice President whose group had solid performance and he was content with his traditional "Safety Numbers." Our new cost of revenue metric revealed that our E.V.P's group was eroding \$7,000,000 in revenue based on his direct and indirect costs. He was shocked to learn that if he had no improved performance in his "Safety Numbers" the first \$7,000,000 of revenue he booked in the following year would go directly to losses. The discussion immediately became dynamic and the E.V.P was anxious to hear more. We realized we had our "their language" metric with an undeniable innovative "WOW" factor.

Strategic Metrics

The following metrics focus on business strategy with respect to Operational Risk Management. We examine three primary categories when measuring strategy. They are: Intercompany Risk Management System, External Client/ New Pursuits and Organizational behavior. Below is a simple summary of the expectations/measurement criteria for each.

- **Intercompany Risk Management System**- Are division managers either reaching out to us to improve their performance or are they working with us to improve the overall Operational Risk Management System?
- **External Client/ New Pursuits**- Are division managers consulting us on new pursuits or potential impacts on current jobs. Are we being proactive or reactive in our behavior?
- **Organizational Behavior**- Are division managers fostering an environment for their employees that promote "doing the right thing when no one is looking"?

Compliance Metrics

We haven't abandoned compliance metrics we have refined them for the executive team. We examine three primary categories when measuring compliance. They are: Intercompany Risk Management System, Contractual Compliance and Regulatory Compliance. The compliance categories are worth 20% less in our scoring model than its strategic counterpart. Below is a simple summary of the expectations/measurement criteria for each.

- **Intercompany Risk Management System**- Are division managers meeting the minimum requirements of the Operational Risk Management System?
- **Contractual Compliance**- Are division managers budgeting for and meeting the minimum requirements as defined by our clients?
- **Regulatory Compliance**- Are division managers budgeting for and meeting the minimum requirements as defined by regulatory agencies having jurisdiction?

The final product of our Advanced Risk Management Business Metrics is illustrated in the graphic below (blue highlights are the innovative metrics). We are pleased to share that since the implementation of our program in 2009 the amount of revenue eroded directly attributed to losses has been improved by over \$80,000,000. This is a quantifiable metric written in operational language ("their language") that has a "WOW" factor which impresses even the most skeptic critic.

Advanced Risk Management Business Metrics

Advanced Risk Management Business Metrics																													
2013 Claim Data													Lagging Indicators through November						Service Center Financial Metrics		Compliance (40% Weight)					Strategic (60% Weight)			Overall Business Unit Safety Score
Division	AS400 Assigned Manager	2010 Total Claims	2011 Total Claims	2012 Total Claims	Auto	GL	Property	Rental Veh.-US	WC	WC-CCIP	2013 Total Claims	% of 2013 total claims	Impact of loss against Revenue	2013 Manhours	% of 2013 Manhours	# of Recordable Incidents	# of DART cases	RIR	DART	COGS	% of total Billing	Internal Operational Risk Management System	Contractual	Regulatory	Internal Operational Risk Management System	External Client/Pursuits	Organizational Behavior		
0		\$3,986	\$17,703		\$3,033				\$1,207		\$4,240	0.63%	\$169,588	784,502	14.84%	0	0	0.00	0	\$0	0.00%	5	3	5	4	2	5	3.93	
1050	Oleg Lukin	\$107,855	\$3,565	\$405	\$268						\$268	0.04%	\$10,702	9,569	0.18%	0	0	0.00	0.00	\$1,438	0.06%	1	2	3	4	5	5	3.60	
2000	Service Centers	\$416,775	\$47,291	\$99,902	\$23,983		\$4,206	\$218	\$76,804		\$105,211	15.59%	\$4,208,457	16,837	0.32%	6	5			\$115,369	5.03%	3	5	1	2	3	4	3.00	
3030	Donald Einarson	\$670,073	\$436,853	\$386,965	\$29,293	\$3,458	\$452		\$75,535	\$10,642	\$119,380	17.69%	\$4,775,189	1,412,891	26.72%	16	13	2.26	1.84	\$835,478	36.40%	5	4	2	3	4	5	3.87	
3040	Luigi Prezioso	\$4,134	\$66,391	\$998	\$1,530				\$42,661		\$44,191	6.55%	\$1,767,637	188,510	3.57%	1	1	1.06	1.06	\$25,244	1.10%	5	5	5	4	5	3	4.40	
3070	Richard Muller				\$361		\$2,746		\$0		\$3,107	0.46%	\$124,279	92,078	1.74%	0	0	0.00	0.00	\$696	0.03%	5	3	5	4	2	5	3.93	
4025	Ronald Keenan	\$19,358	\$198,663	\$21,290	\$19,437	\$4,580			\$0		\$24,017	3.56%	\$960,699	245,510	4.64%	0	0	0.00	0.00	\$313,178	13.64%	1	2	3	4	5	5	3.60	
4030	Ahmed Gokturk	\$23,349	\$4,562	\$53,164								0.00%	\$0	17,000	0.32%	0	0	0.00	0.00	\$2,648	0.12%	3	5	1	2	3	4	3.00	
4040	Ahmed Gokturk	\$25,814	\$17,131	\$7,062	\$5,907				\$17,160		\$23,067	3.42%	\$922,672	245,193	4.64%	2	2	1.63	1.63	\$101,354	4.42%	5	4	2	3	4	5	3.87	
4050	Ahmed Gokturk	\$191,800	\$13,173	\$99,031	\$13,701				\$2,498		\$16,199	2.40%	\$647,956	190,363	3.60%	2	2	2.10	2.10	\$107,199	4.67%	5	5	5	4	5	3	4.40	
4060	Randy Lail	\$5,948		\$31,271	\$2,749		\$1,652		\$28,719	\$366	\$33,486	4.96%	\$1,339,448	145,010	2.74%	5	4	6.90	5.52	\$20,925	0.91%	5	3	5	4	2	5	3.93	
4070	No Longer Exists	\$1,005,561	\$5,828									0.00%	\$0	241	0.00%	0	0	0.00	0.00	\$2	0.00%	1	2	3	4	5	5	3.60	
4080	Mark Heshman	\$0	\$2,456	\$6,016	\$18,334				\$54,829		\$73,163	10.84%	\$2,926,524	61,237	1.16%	2	2	6.53	6.53	\$4,667	0.20%	3	5	1	2	3	4	3.00	
4090	John Welch	\$836	\$79,274	\$1,171	\$2,153				\$110		\$2,263	0.34%	\$90,532	96,478	1.82%	0	0	0.00	0.00	\$253,113	11.03%	5	4	2	3	4	5	3.87	
4095	John Welch			\$20,604	\$1,993						\$1,993	0.30%	\$79,719	11,829	0.22%	0	0	0.00	0.00	\$49	0.00%	5	5	5	4	5	3	4.40	
5050	No Longer Exists		\$500									0.00%	\$0	0	0.00%	0	0	0.00	0.00	\$199	0.01%	5	3	5	4	2	5	3.93	
5070	No Longer Exists	\$30,715	\$14,243									0.00%	\$0	30	0.00%	0	0	0.00	0.00	\$228	0.01%	1	2	3	4	5	5	3.60	
6060	Rhett Whade	\$65,077	\$21,909	\$4,569	\$13,849	\$854			\$6,220	\$0	\$20,922	3.10%	\$836,895	502,474	9.50%	2	2	0.80	0.80	\$37,495	1.63%	3	5	1	2	3	4	3.00	
6070	Robert Link	\$0	\$14,920	\$247			\$1,414		\$0		\$1,414	0.21%	\$56,554	132,249	2.50%	0	0	0.00	0.00	\$5,995	0.26%	5	4	2	3	4	5	3.87	
7070	Glen Drake	\$2,562	\$2,093	\$18,923	\$24,119	\$1,548			\$5,615		\$31,282	4.63%	\$1,251,282	150,844	2.85%	5	4	6.63	5.30	\$13,101	0.57%	5	5	5	4	5	3	4.40	
7080	Robert Kuzdale	\$66,142	\$34,512	\$38,382	\$194				\$8,450		\$8,644	1.28%	\$345,776	342,768	6.48%	3	2	1.75	1.17	\$197,087	8.59%	5	3	5	4	2	5	3.93	
8080	No Longer Exists	\$33,202	\$74,658									0.00%	\$0	102	0.00%	0	0	0.00	0.00	\$0	0.00%	1	2	3	4	5	5	3.60	
8081	No Longer Exists	\$0										0.00%	\$0	255	0.00%	0	0	0.00	0.00	\$0	0.00%	3	5	1	2	3	4	3.00	
8082	Evgeny Kaplun		\$6,949									0.00%	\$0	33,306	0.63%	0	0	0.00	0.00	\$0	0.00%	5	4	2	3	4	5	3.87	
9062	Vernan Hall	\$112,878	\$129	\$54,721	\$0				\$0		\$0	0.00%	\$0	241,647	4.57%	0	0	0.00	0.00	\$4,579	0.20%	5	5	5	4	5	3	4.40	
9064	David Sealock	\$1,039	\$698									0.00%	\$0	2,526	0.05%	0	0	0.00	0.00	\$18	0.00%	3	2	5	4	3	1	2.93	
9090	Michael Keatley	\$34,670	\$739,581	\$72,852	\$102,969	\$3,448	\$425		\$54,470	\$802	\$162,114	24.02%	\$6,484,565	170,879	3.23%	9	5	10.53	5.85	\$202,871	8.84%	1	4	3	3	4	5	3.47	
		\$2,821,775	\$1,803,083	\$917,572	\$263,873	\$13,888	\$10,895	\$218	\$374,279	\$11,810	\$674,962		\$26,998,474	5,706,127		53	42	1.86	1.47	\$2,242,933									

Year	Company Revenue	Service Center Operating Cost	Risk Management Team as a % of Total Revenue	Direct Loss	Indirect Loss	Revenue Recovery Needed to cover losses based on 10% GM goal	Revenue Recovery shown as a percentage to Total Company Revenue.
2010	\$ 810,111,762	\$ 3,746,422	0.46%	\$2,821,775	\$8,465,325	\$112,870,998	14%
2011	\$ 695,405,437	\$ 3,842,065	0.55%	\$1,803,083	\$5,409,249	\$72,123,314	10%
2012	\$ 586,341,393	\$ 2,852,920	0.49%	\$917,572	\$2,752,717	\$36,702,890	6%
2013 (Projected)	\$ 668,644,080	\$ 2,619,160	0.39%	\$809,954	\$2,429,863	\$32,398,169	5%

