

# CHAPTER 1

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## OVERVIEW OF ANSI/AIHA Z10-2012

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On July 25, 2005, the American National Standards Institute (ANSI) approved a new standard entitled *Occupational Health and Safety Management Systems*. Its designation was ANSI/AIHA Z10-2005. That was a major development. *For the first time in the United States, a national consensus standard for a safety and health management system applicable to organizations of all sizes and types was issued.* Z10 is an ANSI-approved standard. Other safety management system guidelines have been issued that do not have the approval of an accrediting organization.

In accord with ANSI requirements, standards must be reviewed at least every five years for revision or reaffirmation. As appropriate, the secretariat, the American Industrial Hygiene Association, formed a committee to review Z10. The outcome of its work is the revised standard approved on June 27, 2012 and designated ANSI/AIHA Z10-2012. Shortly after the approval, the secretariat was transferred to the American Society of Safety Engineers.

All persons who give counsel on occupational safety and health within an organization or who give counsel on occupational safety and health management systems to entities other than their own should have a copy of this revised standard and be thoroughly familiar with its content. Significant changes have been made in the revision, and valuable support information has been added in appendices. With its appendices, the standard is a brief safety and health management system manual.

This standard provides senior management with a well-conceived state-of-the-art concept and action outline to improve a safety and health management system. Drafters of Z10 adopted many of the best worldwide practices. As employers make improvements to meet the standard's requirements, it can be expected that the frequency and

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Second Edition. Fred A. Manuele.

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severity of occupational injuries and illnesses will be reduced. The beneficial societal implications of Z10 are substantial.

Adoption of the Z10 standard or parts of it is believed to be quite broad, but a precise measure of its use and influence would be difficult to develop. Nevertheless, it is significant that:

- Over 7000 copies of the 2005 version of the standard were sold by the American Industrial Hygiene Association (AIHA) and the American Society of Safety Engineers (ASSE). That's a very large number for sales of a standard.
- ASSE, which is now the secretariat for Z10-2012, advised that sales of the latter version have been brisk.
- Several universities have used the first edition of *Advanced Safety Management: Focusing on Z10 and Serious Injury Prevention* in safety degree courses.
- Comments often appear in safety-related literature on Z10 provisions and their application.

This standard has had and will continue to have a significant and favorable impact on the content of the practice of safety and on the knowledge and skill requirements for safety and health professionals. Over time, Z10 will revolutionize the practice of safety.

Since Z10 represents the state of the art, it is not surprising that many organizations do not have management systems in place that meet all its provisions. To identify the shortcomings and to develop an improvement plan, a gap analysis should be made in which the safety and health management systems in place are compared with Z10 requirements.

To assist in developing an understanding of the content and impact of this standard, in this overview chapter we comment on:

- Each section of the standard
- Its history and development as the standard writing committee reached consensus
- A prominent and major theme within Z10
- How that major theme relates to serious injury prevention
- Z10 being a management system standard, not a specification standard
- International harmonization and compatibility
- Long-term influences and societal implications
- The continual improvement process: the Plan-Do-Check-Act concept

## **HISTORY, DEVELOPMENT, AND CONSENSUS**

The American Industrial Hygiene Association obtained approval as the ANSI Accredited Standards Committee for this standard in March 1999. The first full meeting of the committee took place in February 2001. Over a six-year period, as many as 80 safety

professionals were involved as committee members, alternates, resources, and interested commenters. They represented industry, labor, government, business associations, professional organizations, academe, and persons of general interest.

Thus, broad participation in the development of and acceptance of the standard was achieved, and the breadth of that participation is significant. One of the reasons for the Z10 committee's success was its strict adherence to the due-diligence requirements applicable to the development of an ANSI standard. There was a balance of stakeholders providing input and open discussion which resulted in their vetting each issue raised to an appropriate conclusion.

In the early stages of the committee's work, safety and health, quality, and environmental standards and guidelines were collected from throughout the world. They were examined and considered for their applicable content. In crafting Z10, the intent was not only to achieve significant safety and health benefits through its application, but also to have a favorable impact on productivity, financial performance, quality, and other business goals. The standard is built on the well-known Plan-Do-Check-Act process for continuous improvement. We address that subject in Chapter 7.

For the 2012 version, the committee applied the same due-diligence provisions as those required by ANSI. Well over 50 committee members represented industry, government, unions, and educational institutions. And consensus was reached on several revisions and additions representing the current state of the art.

Employers who have a sincere interest in reducing employee injuries and illnesses will welcome discussions on how their safety and health management systems can be improved. A significant number of companies have issued safety policy statements in which they affirm that they will comply with or exceed all relative laws and standards. Those employers, particularly, will want to implement provisions in the standard that are not a part of their safety and health management systems.

## **A MAJOR THEME**

Throughout all the sections of Z10, starting with management leadership and employee participation through the management review provisions, the following theme is prominent. Processes for continual improvement are to be in place and implemented to assure that:

- Hazards are identified and evaluated.
- Risks are assessed and prioritized.
- Management system deficiencies and opportunities for improvement are identified.
- Risk elimination, reduction, or control measures are taken to assure that acceptable risk levels are attained.

In relation to the foregoing, the following definitions as given in the standard are particularly applicable.

*Note: Wherever the wording in this chapter appears in italic type, the material is a direct quote from the standard.*

- **Hazard:** *a condition, set of circumstances, or inherent property that can cause injury, illness, or death*
- **Exposure:** *contact with or proximity to a hazard, taking into account duration and intensity*
- **Risk:** *an estimate of the combination of the likelihood of an occurrence of a hazardous event or exposure(s) and the severity of injury or illness that may be caused by the event or exposures*
- **Probability:** *the likelihood of a hazard causing an incident or exposure that could result in harm or damage—for a selected unit of time, events, population, items or activity being considered*
- **Severity:** *the extent of harm or damage that could result from a hazard-related incident or exposure*
- **Risk assessment:** *process(es) used to evaluate the level of risk associated with hazards and system issues*

In Appendix F, which gives guidance on risk assessment, the definitions above are duplicated. Although *acceptable risk* is not a term included in the standard’s definitions, it is made clear in several places in the standard that the goal is to achieve acceptable risk levels. For example, later in this chapter it is shown that Section 6.4, “Corrective and Prevention Actions,” states clearly that an organization is to have processes in place to ensure that acceptable risk levels are achieved and maintained. Also, Appendix F states: The goal of the risk assessment process including the steps taken to reduce risk is to achieve safe working conditions with an acceptable level of risk. Chapter 2 deals with “Achieving Acceptable Risk Levels: The Operational Goal”.

Understanding the standard’s major theme and these definitions is necessary to apply this standard successfully.

## RELATING THIS MAJOR THEME TO SERIOUS INJURY PREVENTION

A plea is made in Chapter 3, “Innovations in Serious Injury and Fatality Prevention,” for organizations to improve their safety cultures so that a focus on the prevention of serious injuries is embedded into every aspect of their safety and health management systems. In our current economic world, staffs at all levels are expected to do more with less. Seldom will all the resources, money, and personnel be available to address all risks. To do the greatest good with the limited resources available, risks presenting the potential for the most serious harm must be given higher priority for management consideration and action.

## Z10 IS A MANAGEMENT SYSTEM STANDARD

Z10 is not a specification standard—it is a management system standard. What’s the difference between the two? In a management system standard, general process and system guidelines are given for a provision without specifying in detail how the provision is to be carried out. In a specification standard, such details are given. Section 5.2-B of Z10 is used here to illustrate the difference.

*Section 5.2: Education, Training, Awareness, and Competence. The organization shall establish processes to:*

*B. Ensure through appropriate education, training, or other methods that employees and contractors are aware of applicable OHSMS requirements and their importance are competent to carry out their responsibilities as defined in the OHSMS.*

That is the extent of the requirements for Section 5.2B. Comments are made in the advisory part of the standard on certain subjects for which training should be given, such as safety design, incident investigation, hazard identification, good safety practices, and the use of personal protective equipment, but those comments are not a part of the standard.

If Z10 were written as a specification standard, requirements comparable to the following might be extensions of Section 5.2B.

- a. At least 12 hours of training shall be given initially to engineers and safety professionals in safety through design, to be followed annually with a minimum of 6 hours of refresher materials.
- b. All employees shall be given a minimum of 3 hours of training annually in hazard identification.
- c. All employees shall be given a minimum of 4 hours of training annually in the use of personal protective equipment.
- d. All training activities conducted as a part of this provision shall be documented and the records shall be retained for a minimum of 5 years.

## COMPATIBILITY, HARMONIZATION, AND POSSIBLE INTERNATIONAL IMPLICATIONS

One of the goals of the drafters of the standard was to assure that it could be integrated easily into whatever management systems an organization has in place. As to structure, the standard is compatible and harmonized with quality and environmental management system standards: the ISO 9000 and ISO 14000 series. Also, Z10 is written as a generic standard and patterned after the style of those standards. In this context, *generic* means that the standards can be applied to *all*:

- *Organizations of any size or type.*
- *Sectors of activity, whether a business enterprise, a non-profit service provider, or a government entity.*

ISO is the designation for the International Organization for Standardization, which is based in Geneva, Switzerland. It is the world's largest nongovernmental developer of standards, working with a network of the national standards institutes in 148 countries. The United States is represented at the ISO by the American National Standards Institute. On two occasions, in 1996 and 2000, votes were taken at the ISO on developing a standard for an occupational safety and health management system. In the latter case, the vote against carried by a narrow margin. The membership of ISO is worldwide, and a consensus among its members for such a standard had not yet emerged.

Of particular note is the recognition given in Z10's introduction to the International Labour Organization's *Guidelines on Occupational Health and Safety Management Systems* as a resource. The designation for the *Guidelines* is ILO-OSH 2001. It is a good, additional reference for safety and health management systems. The *Guidelines* can be downloaded at [http://us.yhs4.search.yahoo.com/yhs/search?p=ilo+osh+2001+management+systems&hspart=att&hsimp=yhs-att\\_001&type=att\\_lego\\_portal\\_home](http://us.yhs4.search.yahoo.com/yhs/search?p=ilo+osh+2001+management+systems&hspart=att&hsimp=yhs-att_001&type=att_lego_portal_home).

ILO is an international organization of considerable influence. Intentionally, Z10 adopts from and is in harmony with ILO-OSH 2001. Similarities between the *Guidelines* and Z10 are notable; But Z10 goes beyond the *Guidelines* in some respects.

Z10 was approved by a recognized standards-approving organization (i.e., ANSI) and represents current best practices. Since consideration will probably again be given to the development of an international safety and health management system standard at ISO, one can easily speculate on Z10 becoming the model for that standard. Continue the speculation: International requirements for accredited safety and health management system audits related to the provisions of Z10 can be envisioned.

## LONG-TERM INFLUENCE: SOCIETAL IMPLICATIONS

As the provisions of this ANSI standard continue to be brought to the attention of employers as they strive to have safety management systems that are compatible with its provisions, its impact on what employers and society believe to be an effective safety management system will be extensive. Over time, Z10 will become the benchmark against which the adequacy of safety and health management systems will be measured. Societal expectations of employers with respect to their safety and health management systems will be defined by the standard's provisions.

### Employment Implications

A recent and brief verbal survey of professors engaged in safety degree programs indicates that employers of safety professionals are seeking candidates who are equipped with the knowledge and skill to give counsel on meeting many of the provisions in the standard. In that respect, certain provisions of the standard are of particular note—provisions to which safety professionals should give particular attention. Those provisions are given in “Planning,” Section 4.0; “Implementation and Operations,” Section 5.0; and “Evaluation and Corrective Action,” Section 6.0.

In summary, they state that employers “shall” establish and implement processes to:

- Identify and control hazards in the design process and when changes are made in operations. That requires that safety design reviews be made for new and altered facilities and equipment.
- Have an effective management of change system in place—through which hazards and risks are identified and evaluated in the change process.
- Assess the level of risk for identified hazards—for which knowledge of risk assessment methods will be necessary.
- Utilize a prescribed hierarchy of controls in dealing with hazards to achieve acceptable risk levels—for which the first step is to attempt to design out or otherwise eliminate the hazard.
- Avoid bringing hazards into the workplace—by incorporating design and material specifications in procurement contracts for facilities, equipment, and materials.

### **Educational Implications**

Since one of the criteria for success of a technical degree program is the employment possibilities for graduates, prudent professors responsible for safety programs are assuring that core courses equip students properly to meet employer needs. In many cases that has necessitated substantive curricula modifications. This textbook has been adopted in several university safety degree programs at both the bachelors and masters, degree levels.

### **Certification Implications**

Provisions in Z10 have a direct relationship to the content of examinations for the Certified Safety Professional (CSP) designation. Those examinations are reviewed about every five years to assure that they are current with respect to what safety professionals actually do. In the review process, safety professionals are asked to tell the surveyor about the reality of the content of their work at the time the survey is made.

For a review of current educational requirements to prepare a student to enter the practice of safety, I instituted a study to compare the content of the Comprehensive Practice Examination Guide issued by the Board of Certified Safety Professionals in 2011 with that issued in 2006. Substantial changes were made in the later edition, and many of them relate to the principal requirements of Z10. It is not said here the changes resulted from the issuance of Z10. But it is said that Z10 represents sound practice with respect to the actuality of an occupational health and safety management system.

### **OSHA Implications**

A good reference on the possible implications of Z10 with respect to OSHA and to the legal liability potential is the March 2006 publication entitled *Legal Perspectives—ANSI Z10-2005 Standard: Occupational Health and Safety Management Systems*.

It was written by Adele Abrams, an attorney and American Society of Safety Engineers advocate in Washington, DC. I recommend that safety professionals read the full version of the paper, which is on the Internet. Access is achieved by entering the title of the paper into a search engine. Briefly, Abrams writes:

Although it is unlikely that OSHA will resume regulatory activity to adopt a federal safety and health management systems standard at this time, if such activity was commenced in the future, OSHA would be obligated to consider adopting Z10 as that standard. Federal legislation and administrative rules direct agencies to use voluntary consensus standards in lieu of developing government-unique standards, except when such use would be inconsistent with the law or otherwise impractical. [*Author's note:* This was written in 2006. OSHA did begin activity on an injury and illness prevention program, which has stalled. The premise cited here is one of the many obstacles. As a matter of principle, it is not conceivable that OSHA could issue an injury and illness prevention program whose provisions required less than those of an accredited national consensus standard].

Z10 could also have enforcement ramifications under OSHA's General Duty Clause (Section 5a), which requires that employers maintain a place of employment that is free from recognized hazards that are causing or are likely to cause death or serious injuries. Meeting the requirements of Z10 could be agreed upon during discussions between OSHA and employers as they developed consent orders to resolve citations made during inspections.

## **Legal Liability Implications**

For safety consultants who give advice on safety management systems to employers other than their own employer, the issuance of this standard presents legal liability potentials for which they should be knowledgeable. These excerpts from Abrams' paper are pertinent.

Safety and health professionals have an obligation to keep abreast of the latest knowledge and to include "best practices" in their safety programs and consultation activities, to the maximum extent feasible. Knowledge and comprehension of the ANSI Z10 standard may be imputed to safety professionals, in terms of determining what a "reasonable person" with similar training would be likely to know. Willful ignorance of the best practices set forth in Z10 and/or failure to incorporate such preventive measures in the workplace or programs under the safety and health professional's direction or oversight could lead to personal tort liability or professional liability.

*Consider the following scenario.* An employer receives a citation from OSHA. In the negotiations that follow, the employer agrees with OSHA that the safety management system must be improved. You, a safety consultant, receive a phone call from the



obviously stressed employer asking that you provide counsel on the improvements to be made so that the safety management system meets good standards.

You call on the employer, agree on a course of action and a price, and the arrangements are confirmed through a letter contract. You decide that the framework you will use to help the employer is a typical safety management system, which does not contain the provisions in Z10 pertaining to safety design reviews, management of change, risk assessments and prioritization, a hierarchy of controls, and including safety specifications in purchasing agreements. Your counsel is well received and acted upon. Your contract is fulfilled and you have been paid.

Later, an incident occurs in the employer's operations and an employee is injured severely. Since workers' compensation laws govern, the employee cannot sue the employer. The employee's lawyer casts a large net to identify defendants. She discovers that you provided counsel on improvements to be made in the employer's safety management system.

You are on the witness stand. The employee's lawyer is ready. She studied the safety management system document on which you based consultation with your client and she has knowledge of the ANSI standard *Occupational Health and Safety Management Systems*, approved in 2012. You are led through the entirety of the substance of your advice to the employer. Then the lawyer establishes that you, a safety professional, have knowledge of ANSI standards. She gets you to agree that ANSI standards establish the minimum requirements for the subjects to which they apply and that, over time, they acquire a quasi-official status. She takes the position that Z10 represents the state of the art.

The lawyer works you through the elements in Z10 that were not addressed in the counsel you gave to your client and relates your omissions to the causal factors for the incident and injuries that occurred to her client. She establishes that you, as a safety professional, have an obligation to be familiar with and apply the state of the art in the counsel you give. She emphasizes, particularly, that your counsel was not based on the state of the art. Since you were negligent, you are liable.

Consultants who give advice to organizations to improve their safety and health management systems on a fee basis have reviewed the foregoing scenario and say that it is plausible.

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New appendices added to the 2012 version of Z10 are: F, “Risk Assessment”; I, “Procurement”; J, “Contractor Safety and Health”; M, “Management of Change”; and N, “Management System Standard Comparison.”

Some appendices provide extensive detail on the subjects covered. Others give explanatory comments, examples of forms and procedures, and reference sources for many of the sections to which they apply. Although the appendices are not part of the standard, they can be helpful to those who have implementation responsibility.

## THE CONTINUAL IMPROVEMENT PROCESS: THE PDCA CONCEPT

Z10 is built on the well-known Plan-Do-Check-Act (PDCA) process for continual improvement. Understanding the PDCA concept is necessary to effectively implement the standard. A review of the concept is given in Chapter 7. “The Plan-Do-Check-Act Concept (PDCA).”

In Z10’s Introduction there is a chart based on the PDCA concept. A slightly reduced form of the chart is presented at the beginning of each of the standard’s major sections. That version is shown in Chapter 7. Similar continual improvement charts based on the PDCA concept are shown in the Quality Management Systems Standards—ANSI/ISO/ASQ Q9000-2000 series. The ISO 14000 series on environmental management was revised in 2004 to make it compatible with the ISO 9000 series. It is also based on the PDCA concept. In addition, the U.S. Environmental Protection Agency (EPA) suggests building an environmental management system on a PDCA model.

Throughout the standard, the words *process*, *processes*, *implemented*, and *continual improvement* are often repeated. That is also the case in the standards on quality and environmental management cited previously. Z10 is based on a continual improvement approach. The standard outlines the *processes* to be put in place, *not the specifics*, to have an effective safety and health management system.

Brief comments will be made here to provide an overview of the major sections of the standard. With respect to these remarks, keep in mind the intent of the terms *shall* and *should*. As is common in ANSI standards, requirements are identified by the word *shall*. An organization that chooses to conform to the standard is expected to fulfill the *shall* requirements. The word *should* is used to describe recommended practices or to give an explanation of the requirements. Recommended practices and advisory comments are not requirements of the standard.

## SECTION 1.0: THE SCOPE, PURPOSE, AND APPLICATION OF Z10

### Section 1.1: Scope

This section defines the *minimum requirements* (my emphasis) for occupational health and safety management systems (OHSMS). Even though the standard says that it sets forth minimum requirements, only a small segment of employment locations have safety management systems in place that include all of its elements, particularly those pertaining to safety through design and management of change concepts.

The emphasis in the advisory data is on a generic and systems approach for continual improvement in safety and health management and the avoidance of specifications. Further, the writers of the standard recognized the uniqueness of the culture and organizational structures of individual organizations and the need for each entity to “define its own specific measures of performance.”

ANSI standards acquire a quasi-official status and may be viewed as containing only the minimum requirements—that is, the fewest requirements—which may not be sufficient in a particular situation. Repeating for emphasis: Safety consultants who give counsel on safety management to employers other than their own employer should recognize the status that ANSI standards acquire from a legal liability viewpoint.

### Section 1.2: Purpose

This section states that the primary purpose of this standard is to provide a management tool to reduce the risk of occupational injuries, illnesses, and fatalities.

### Section 1.3: Application

This section states that this standard is applicable to organizations of all sizes and types. As is the case in the ISO 9000 and ISO 14000 series of standards, there are no limitations or exclusions in Z10 by industry or business type or number of employees. Z10 applies to all employers. In the introduction and in comments in the advisory column opposite Section 1.3, it is made clear that the structure of the standard is to allow integration with quality and environmental management systems. Doing so is a good idea.

## SECTION 2.0: DEFINITIONS

As is typical in ANSI standards, definitions are given of certain of the terms used in the standard. Safety professionals should become familiar with them. One addition was made to the definitions in the 2012 version: which is – *Risk Assessment: Process(es) used to evaluate the level of risk associated with hazards and system issues.*

## SECTION 3.0: MANAGEMENT LEADERSHIP & EMPLOYEE PARTICIPATION

Section 3.0 is dealt with only briefly here. In Chapter 8 “Management Leadership and Employee Participation” we emphasize the significance of management leadership, the culture derived from management leadership, and managing change.

It should be understood that Section 3.0 is the standard’s most important section. Safety professionals will surely agree that *Top management leadership and effective employee participation are crucial for the success of an Occupational Health and Safety Management System (OHSMS)*. Top management leadership is vital because it sets an organization’s safety culture and because continual improvement processes cannot be successful without sincere top management direction. Key statements in the “shall” column of the standard follow.

**3.1.1** *Top management shall direct the organization to establish, implement and maintain an OHSMS.*

**3.1.2** *The organization’s top management shall establish a documented occupational health and safety policy.*

**3.1.3** *Top management shall provide leadership and assume overall responsibility*

**3.2** *The organization shall establish a process to ensure effective participation in the OHSMS by its employees at all levels.*

As management provides direction and leadership, assumes responsibility for the OHSMS, and ensures effective employee participation, the purpose of the standard must be kept in mind—to reduce the risk of occupational injuries, illnesses, and fatalities. That will be done best if personnel in the organization understand that in the application of every safety and health management process, the outcome is to achieve acceptable risk levels, and that a special focus must be given to identifying the causal factors for incidents that result in serious injuries. In Chapter 2, “Achieving Acceptable Risk Levels: The Operational Goal,” we provide guidance on achieving acceptable risk levels.

In some incident investigation reports on serious injuries and fatalities it is apparent that contributing causal factors derived from severe expense and staff reductions. Maintenance staffs were reduced significantly. Preventive maintenance schedules could not be maintained. Safety-related work orders were given lower priority. Section 3.1.3A requires that management provide appropriate resources.

Over the long term, not providing resources to replace equipment at the end of its expected life and severely reducing maintenance capability increase serious injury and fatality potential significantly. This section—providing adequate resources—has more significance in the economic times being experienced at present.

There is supporting data in Annexes A, B, and C on policy statements, roles and responsibilities, and employee participation. Another good reference on management leadership and employee involvement is the chapter “Superior Safety Performance: A Reflection of an Organization’s Culture” in my book *On the Practice of Safety, 4th edition*.

## SECTION 4.0: PLANNING

In the PDCA process, planning is the first step. As would be expected, this section sets forth the planning process to implement the standard and to establish plans for improvement. *The planning process goal is to identify and prioritize OHSMS issues (defined as hazards, risks, management system deficiencies and opportunities for improvement).* (Note the emphasis on hazards, risks, and management system deficiencies.)

In the continual improvement process, as elements in the standard are applied, information defining opportunities for further improvement in the safety and health management system, and thereby risk reduction, is to be fed back into the planning process for additional consideration.

**4.1** Requires that a review be made to identify the differences between existing operational safety management systems and the requirements of the standard.

*The review shall include information regarding:*

- A. *Relevant business systems and operational processes;*
- B. *Operational issues such as, hazards, risks, and controls;*
- C. *Previously identified OHSMS issues;*
- D. *Allocation of resources;*
- E. *Applicable regulations, standards, and other health and safety requirements;*
- F. *Risk assessments and evaluations;*
- G. *Process and mechanisms for employee participation;*
- H. *Results of audits; and*
- I. *Other relevant activities.*

**4.2** Sets forth the requirements for Assessment and Prioritization.

*The organization shall establish a process to assess and prioritize OHSMS issues on an ongoing basis. The process shall:*

- A. *Assess the impact on health and safety of OHSMS issues and assess the level of risk for identified hazards;*
- B. *Establish priorities based on factors such as the level of risk, potential for system improvement, standards, regulations, feasibility, and potential business consequences; and*
- C. *Identify underlying causes and other contributing factors related to system deficiencies that lead to hazards and risks.*

For clauses 4.2A and 4.2B, the following are selected explanatory notes.

*E4.2A: The assessment of risks should include factors such as: identification of potential hazards; exposure, measurement data; sources and frequency of exposure; human behavior, capabilities, and other human factors; types of measures used to control hazards, and potential severity of hazards.*

*E4.2B: Business consequences may include either increased or decreased productivity, sales or profit or public image.*

So, employers are to have processes in place to identify and analyze hazards, assess the risks deriving from those hazards, and establish priorities for amelioration which, when acted upon, will attain acceptable risk levels. Appendix D provides guidance on assessment and prioritization.

### **Section 4.3: Objectives**

*The organization shall establish a process to set documented objectives, quantified where practicable, based on issues that offer the greatest opportunity for OSHMS improvement and risk reduction.*

### **Section 4.4: Implementation Plans and Allocation of Resources**

This section follows logically in accord with a sound problem-solving procedure. After hazards, risks, and shortcomings in safety management systems have been identified and objectives have been outlined, a plan should be established and implemented to achieve the objectives. Item B in Section 4.4 reads as follows: “Assign resources to achieve the established objectives of the implementation plans”. It is an absolute that if adequate resources are not provided, over time, acceptable risk levels cannot be maintained.

## **SECTION 5.0: IMPLEMENTATION AND OPERATION**

*This section defines the operational elements that are required for implementation of an effective OHSMS. These elements provide the backbone of an OHSMS and the means to pursue the objectives from the planning system.*

### **Section 5.1: OHSMS Operational Elements**

Six operational elements are to be integrated into the management system. A new and important addition to Z10 was made in this section. It follows.

#### **Section 5.1.1 Risk Assessment**

*The organization shall establish and implement a risk assessment process(es) appropriate to the nature of hazards and level of risk.*

Adding this “shall” provision reflects a worldwide trend emphasizing the importance of risk assessments. Appendix F provides a six-page overview of risk assessment and includes data on a few techniques. Chapter 11 in this book is titled “A Primer on Hazard Analysis and Risk Assessment”. It provides guidance with respect to the standard’s risk assessment provision. Chapter 16 is titled “Prevention through Design”, which relates to ANSI/ASSE Z590.3, the Prevention through Design standard. It is made clear in that chapter that hazard analysis and risk assessment are at the core

of prevention through design concepts and of Z10. Brief descriptions are given in Chapter 16 of several hazard analysis and risk assessment techniques.

Having knowledge of preliminary hazards analysis, what-if/check analysis, and failure mode and effects analysis and how they are applied will satisfy the needs of safety professionals as they give counsel on risk assessment. It may be that a risk situation is so complex that consulting skills must be engaged to apply quantitative risk assessment methods—but that will be the exception.

In the application of these hazard analysis and risk assessment techniques, qualitative rather than quantitative judgments will be sufficient. Mathematical calculations required will not be extensive. Appendix F provides an example of a risk assessment matrix. Risk assessment matrices set forth incident probability categories, severity of harm or damage ranges, and resulting risk levels. A risk assessment matrix can serve as a valuable instrument in working with decision makers on setting risk levels and prioritizing ameliorating actions. Variations in published risk assessment matrices are substantial. A safety professional should develop a matrix that is suitable to the organization to which counsel is given. Appendix F also includes a hazard analysis and risk assessment guide, which is comparable to the guide shown in Chapter in 16 this book titled “Prevention through Design”.

### Section 5.1.2 Hierarchy of Controls

Although we said earlier that Z10 is a management system standard and not a specification standard, the provisions pertaining to a hierarchy of controls are the exception. Provisions for the use of a specifically defined hierarchy of controls are outlined. The organization “shall” apply the methods of risk reduction in the order prescribed. This is how the standard and the explanatory comments read.

*The organization shall establish a process for achieving feasible risk reduction based upon the following preferred order of controls:*

- A. Elimination;
- B. Substitution of less hazardous materials, processes, operations, or equipment;
- C. Engineering controls;
- D. Warnings;
- E. Administrative controls; and,
- F. Personal protective equipment.

*Feasible application of this hierarchy of controls shall take into account:*

- a. The nature and extent of the risks being controlled;
- b. The degree of risk reduction desired;
- c. The requirements of applicable local, federal, and state statutes, standards and regulations;
- d. Recognized best practices in industry;
- e. Available technology;



- f. *Cost-effectiveness; and,*
- g. *Internal organization standards.*

*E5.1.2: The hierarchy provides a systematic way to determine the most effective feasible method to reduce the risk associated with a hazard. When controlling a hazard, the organization should first consider methods to eliminate the hazard or substitute a less hazardous method or process. This is best accomplished in the concept and design phases of any project. Refer to Section 5.1.3. If this is not feasible, engineering controls such as machine guards and ventilation systems should be considered. This process continues down the hierarchy until the highest level feasible control is found. Often a combination of controls is most effective. In cases where the higher order controls (elimination, substitution and implementation of engineering controls) do not reduce risk to an acceptable level, lower order controls (e.g. warnings, administrative controls, or personal protective equipment) are used to complement engineering controls to reduce risks to an acceptable level.*

*For example, if an equipment modification or noise enclosure (engineering control) is insufficient to reduce noise levels, then limiting exposure through job rotation and using hearing protection would be an acceptable supplemental means of control.*

Note that this standard prescribes a hierarchy of controls that contains six elements, the first of which, in priority order, is to design out or otherwise eliminate the hazard. If the hazard is eliminated, the risk is eliminated. Also, the substitution element is separate from the elimination element. That may not be so in other published hierarchies of controls. Some hierarchies have as few as three elements.

Annex G provides a pictorial and verbal display of the hierarchy of controls listed in Section 5.1.1 with application examples for each element. In an occupational setting, these outcomes are to be achieved through application of the hierarchy of controls.

1. Acceptable risk levels
2. Work methods and processes for which the probability is as low as reasonably practicable for:
  - a. Errors being made by supervisors and workers because of design inadequacy
  - b. Supervisors and workers defeating the system

Comparable outcomes should be expected through application of the hierarchy of controls for such as the design and use of industrial or consumer products, and environmental management systems.

The hierarchy of controls in Z10 is very close in substance to the model shown in Chapter 14, “Hierarchy of Controls” in this book. In that chapter, to move the state of the art forward, the hierarchy of controls is contained within a sound problem-solving technique. Also, the chapter includes a dissertation on the logic of taking action in an order of effectiveness, which relates directly to the hierarchy of controls in Z10.

### Section 5.1.3 Design Review and Management of Change

The following excerpts indicate what the standard *requires* for design reviews and management of change and replicate the explanatory information given in its right-hand column. To repeat for emphasis: These are “shall” provisions.

*The organization shall establish a process to identify, and take appropriate steps to prevent or otherwise control hazards at the design and redesign stages, and for situations requiring Management of Change to reduce potential risks to an acceptable level. The process for design and redesign and Management of Change shall include:*

- A. *Identification of tasks and related health and safety hazards;*
- B. *Recognition of hazards associated with human factors including human errors caused by design deficiencies;*
- C. *Review of applicable regulations, codes, standards, internal and external recognized guidelines;*
- D. *Application of control measures (hierarchy of controls—Section 5.1.2);*
- E. *A determination of the appropriate scope and degree of the design review and management of change; and*
- F. *Employee participation.*

*E5.1.3E: The process for conducting design reviews and managing changes is designed to prevent injuries and illnesses before new hazards and risks are introduced into the work environment. The design review should consider all aspects, including design, construction, operation, maintenance, and decommissioning. The following are examples of conditions that should trigger a design review or management of change process:*

- *New or modified technology (including software), equipment, or facilities;*
- *New or revised procedures, work practices, design specifications;*
- *Different types and grades of raw materials;*
- *Significant changes to the site’s organizational structure and staffing, including use of contractors;*
- *Modification of health and safety devices; and*
- *New health and safety standards or regulations.*

**The Design Process** For quite some time, I and others have professed that the most effective and economical way to achieve acceptable risk levels is to have the hazards from which they derive addressed in the design process. That’s what this standard requires. This is an exceptionally important element in this standard. Its impact can be immense.

To become qualified to give counsel on establishing a management system to apply the design review requirements in Z10, a large percentage of safety practitioners will

have to acquire new knowledge and skills. An introduction to this subject can be found in Chapter 15 titled “Safety Design Reviews”. The book *Safety Through Design* is also a substantive reference for the design process.

If a management system for design safety reviews is not in place in an organization, safety professionals should anticipate a long-term effort to achieve the culture change necessary to meet the requirements of Z10. This often means establishing a management system that mobilizes engineering, purchasing, quality control, and other departments that may not be accustomed to working collaboratively. To develop an understanding of the depth of what is to be undertaken, the chapter “Achieving the Necessary Culture Change” in *Safety Through Design* will help.

**Management of Change** Employers are to have processes in place to identify and take appropriate steps to prevent or otherwise control hazards and reduce the potential risks associated with them when changes are made to existing operations, products, services, or suppliers. Getting effective management of change procedures in place is not easy.

With respect to drafting and implementing management of change procedures, generalists in the practice of safety can learn from the safety personnel in organizations that have met the management of change requirements of *OSHA’s Rule for Process Safety Management of Highly Hazardous Chemicals*, 29 CFR 1910.119, issued in 1992. Briefly, 1910.119 requires that employers establish and implement written procedures to manage changes. Z10 and 1910.119 requirements have similar purposes.

My research shows that for all occupations, many incidents resulting in serious injury occur when out-of-the-ordinary situations arise, particularly when unusual and nonroutine work is being done and when there are sources of high energy present. In support of that premise, consider this excerpt from the historical and explanatory data published with respect to 1910.119:

*Management of Change:* OSHA believes that one of the most important and necessary aspects of a process safety management program is appropriately managing changes to the process. This is because many of the incidents that the Agency has reviewed resulted from some type of the change to the process. While the Agency received some excellent suggestions concerning minor changes to improve this proposed provision, there was widespread support for including a provision concerning the management of change in the final rule.

Note that there was widespread support for the management of change provisions. About two years after 1910.119 became effective, Thomas Seymour, a director at OSHA who was in a leadership role as the standard was developed, stated that the feedback that OSHA received from chemical plant operators was that the management of change requirement in the standard was the most difficult to apply. Safety directors in chemical companies verified that statement. It is not surprising that specially focused courses have been developed to assist those who have the responsibility to meet the 1910.19 management of change requirements.

It is suggested that safety professionals study thoroughly the management of change requirements of Z10 to determine how they might assist in achieving the culture change necessary for their implementation. Applying change management methods will be necessary. Fortunately, the literature on change management is extensive. Chapter 19 addresses “Management of Change.”

Note that Sections 5.1.3.1 and 5.1.3.2 are extensions of Section 5.1.3, “Design Review and Management of Change.”

**5.1.3.1 Applicable Life-Cycle Phases** *During the design and redesign processes, all applicable life cycle phases shall be taken into consideration.*

**5.1.3.2 Process Verification** *The organization shall have processes in place to verify that changes in facilities, documentation, personnel and operations are evaluated and managed to ensure safety and health risks arising from these changes are controlled.*

## Section 5.1.4 Procurement

Although the requirements for procurement are plainly stated and easily understood, they are brief in relation to the enormity of what will be required to implement them. An interpretation of the requirements could be: Safety practitioners, you are assigned the responsibility to convince management and purchasing agents that in the long term, it can be very expensive to buy cheap. This is how the standard and the explanatory data read.

*The organization shall establish and implement processes to:*

- A. *Identify and evaluate the potential health and safety risks associated with purchased products, raw materials, and other goods and related services before introduction into the work environment;*
- B. *Establish requirements for supplies, equipment, raw materials, and other goods and related services purchased by the organization to control potential health and safety risks; and*
- C. *Ensure that purchased products, raw materials, and other goods and related services conform to the organization’s health and safety requirements.*

*E5.1.4: The procurement process should be documented. See section E5.4.*

*E5.1.4A: For example, organizations should evaluate SDSs (Safety Data Sheets) and other health and safety information of a new chemical, or examine the design specifications and operations manual for a new piece of equipment being considered for purchase.*

Only a small percentage of employers have included specifications in their purchasing agreements and contracts that require suppliers to identify the hazards

and assess the potential risks in the equipment and materials being purchased. As a safety director in a major company said recently, the only safety specification in their contracts is that OSHA standards and other legislative requirements be met. Chapter 20, “The Procurement Process” provides guidance on how to avoid bringing hazards into the workplace. So does Appendix I.

This Z10 standard implies that safety through design concepts are to be applied in an organization’s purchasing system with respect to both physical hazards and work methods. Adding an element to safety management systems that is to avoid bringing hazards into the workplace could have startling good results in reducing the frequency and severity of hazardous incidents and exposures.

Although procedures encompassing the procurement requirements will not be put in place easily, recognition builds slowly that they should be an integral part of a safety management system. Getting these procurement provisions established presents a huge challenge for safety professionals, but the benefits can be immense.

### **Section 5.1.5 Contractors**

This section requires that an organization have processes in place to avoid injury and illness to the organization’s employees from activities of contractors and to the contractor’s employees from the organization’s operations. Many entities have such procedures in place. One of the “shall” provisions indicates that the process is to include “contractor health and safety performance criteria.” That implies, among other things, vetting the contractor with respect to its previous safety performance before awarding a contract.

### **Section 5.1.6 Emergency Preparedness**

To meet the requirements of this provision, an organization is to have management systems in place *to identify, prevent, prepare for, and/or respond to emergencies*. Also, periodic drills are to be conducted to test the emergency plans, and they are to be updated periodically.

## **Section 5.2: Education, Training, Awareness, and Competence**

An organization is required to determine the knowledge needed to achieve competence, ensure that employees are aware of the OHSMS requirements, remove any barriers to participation in education, ensure that training is given in a language trainees understand and that training is ongoing, and ensure that trainers are competent. This section has six alphabetically designated provisions. In three of them, the words *competence* or *competent* appear. Thus, competence is emphasized. Employees and contractors are to be competent to fulfill their responsibilities. Trainers are to be competent to train.

These provisions, the standard says, are applicable to contractors also, which could be difficult to do. Comments in the advisory column, which are of some length on training, do not mention contractors. It is interesting that in the examples of the

training that should be given, both safety design and procurement are mentioned. This is how item E5.2A reads:

*E5.2A: Training in OHSMS responsibilities should include, for example, training for: Engineers in safety design (e.g. hazard recognition, risk assessment, mitigation, etc....); Those conducting incident investigations and audits for identifying underlying OHSMS non-conformances; Procurement personnel on impact of purchasing decisions; and others involved with the identification of OHSMS issues, methods of prioritization, and controls.*

### **Section 5.3: Communication**

An organization is to institute processes to communicate information about the progress being made on its implementation plan; ensure prompt reporting of incidents, hazards, and risks; promote employee involvement so that they make recommendations on hazards and risks; inform contractors and *relevant external interested parties* of changes made that affect them; and remove barriers to all of the foregoing. With respect to contractors, item E5.3D gives guidance as follows:

*E5.3D: The work activities of contractors can pose additional hazards for both employees and others in the workplace. Processes established for consultation with contractors should ensure risks will be appropriately addressed using good OHS practices. This consultation should include discussion and resolution of issues of mutual concern.*

### **Section 5.4: Document and Record Control Process**

Documentation requirements for certain systems are specified in several places in Z10. As a performance standard would say, the document and record control processes are to fit the requirements of the safety and health management system in place. In the informational column, sound advice is given on the documentation process as follows.

*E5.4: The type and amount of formal documentation necessary to effectively manage an OHSMS should commensurate with the size, complexity, and risks of an organization.*

An organization shall have document and record-keeping processes to (1) *implement an effective OHSMS*, and (2) *demonstrate or assess performance with the requirements of this standard*. Documents shall be updated as needed, legible, adequately protected against damage or loss, and retained as necessary.

## **SECTION 6.0: EVALUATION AND CORRECTIVE ACTION**

This section of the standard outlines the requirements for processes to evaluate the performance of the safety management system and to take corrective action when shortcomings are found. Communications on lessons learned are to be fed back into

the planning process. The expectation is that new objectives and action plans will be written in relation to what has been experienced.

### **Section 6.1: Monitoring, Measurement, and Assessment**

*The organization shall establish and implement a process to monitor and evaluate hazards, risks, and their controls to assess OHSMS performance. These processes shall include some or all of the following methods, depending on the nature and extent of identified hazards and risks: workplace inspections and testing, assessments of exposures, incident tracking, measuring performance in relation to legal or other requirements; or other methods selected by the organization. Results of the monitoring processes shall be communicated as appropriate.*

### **Section 6.2: Incident Investigation**

*The organization shall establish a process to report, investigate and analyze incidents in order to address OHSMS non-conformances and other factors that may be causing or contributing to the occurrence of incidents. The investigations shall be performed in a timely manner.*

Because of studies this author has made, greater emphasis is now given to the importance of incident investigation because of its value in identifying cultural, operational, and technical causal factors for incidents that result in serious injuries and illnesses. However, the requirement for incident investigation in Z10 is contained in one brief paragraph, with no subsections. For a subject as important as incident investigation, it might seem that it is dealt with briefly. But as a “shall” requirement, nothing else need be said.

Advisory comments on incident investigation are more extensive. One of the significant advisory comments states that there is a value in feeding lessons learned from investigations into the planning and corrective-action processes. That fits well with the emphasis being given in this book to serious injury and illness prevention. This subject is explored in depth in Chapter 22, “Incident Investigation.”

### **Section 6.3: Audits**

An organization shall have audits made periodically with respect to application of the provisions in the OHSMS, ensure that audits are made by competent persons not attached to the location being audited, document and communicate the results, and have auditors communicate immediately on potentials for serious injuries or illnesses and fatalities so that swift corrective action can be taken.

Audits are to measure the organization’s effectiveness in implementing the elements of the occupational health and safety management system. Thus, audits are to determine whether the management systems in place do or do not effectively identify hazards and control risks.

Although many safety professionals are familiar with safety audit processes, it is suggested that they review what the standard requires and determine whether it will



be to their benefit to revise their audit systems. Annex L is helpful in this respect. It contains a sample audit protocol that matches all the sections of Z10.

An expanded treatise on safety audits is presented here in Chapter 23, “Audits”. In the advisory column, it is made clear that audits are to be “system” oriented rather than “compliance” oriented.

Also, and importantly, E.6.3B clarifies the independence of auditors. While it says that *audits should be conducted by individuals independent of the activities being audited*, it also says that *this does not mean that audits must be conducted by individuals external to the organization*.

## Section 6.4: Corrective and Preventive Actions

Revisions made in the 2012 version of Z10 are substantial in relation to the earlier version. It is duplicated here as written. It defines what the organization “shall” do to fulfill the provisions of this section.

*The organization shall establish and implement corrective and preventive action processes to:*

- A. *Address non-conformances and hazards that are not being controlled to an acceptable level of risk.*
- B. *Identify and address new and residual hazards associated with corrective and preventive actions that are not being controlled to an acceptable level of risk.*
- C. *Expedite action high risk hazards (those that could result in fatality or serious injury/illness) that are not being controlled to an acceptable level of risk; and*
- D. *Review and ensure effectiveness of corrective and preventive actions taken.*

This is a major change in relation to the Section 6.4 provisions in the original version of Z10 in that there were no specifically stated requirements in the initial document to achieve acceptable risk levels. These new provisions recognize the general acceptance throughout the world that in an occupational setting, a goal is to achieve and maintain an acceptable risk level. It is now clearly stated in Z10 that organizations are to identify shortcomings in safety management systems and take preventive action as necessary to achieve acceptable risk levels—expediting the appropriate actions on high-risk hazards.

## Section 6.5: Feedback to the Planning Process

As stated in the advisory column, this is a communication provision pertaining to all shortcomings in the safety management system. Its purpose is to provide a base for revision in the planning process. The standard says:



*The organization shall establish and maintain process to ensure that the results of monitoring and measurement, audits, incident investigation, and corrective and preventive actions are included in the ongoing planning process (Section 4.2) and the management review (Section 7).*

## **SECTION 7.0: MANAGEMENT REVIEW**

This section requires that the OHSMS performance be reviewed periodically and that management take appropriate actions in accord with the results of the review. The management review section and extensive advisory comments pertaining to it are “must” reading. We stated earlier in this chapter that Management Leadership and Employee Participation is the most important section in Z10. This section on Management Review is a close second. Making periodic reviews of management systems effectiveness is an important part of the Plan-Do-Check-Act process.

### **Section 7.1: Management Review Process**

*The organization shall establish and implement a process for top management to review the OHSMS at least annually, and to recommend improvements to ensure its continued suitability, adequacy, and effectiveness.*

*E.7.1: Management reviews are a critical part of the continual improvement of the OHSMS.*

These are some of the subjects to be reviewed, at least annually: progress in the reduction of risk; effectiveness of processes to identify, assess, and prioritize risk and system deficiencies; effectiveness in addressing underlying causes of risks and system deficiencies; the extent to which objectives have been met; and performance of the OHSMS in relation to expectations.

### **Section 7.2: Management Review Outcomes and Follow-Up**

This section requires that management determine whether changes need to be made *in the organization’s policy, priorities, objectives, resources, or other OHSMS elements* to establish the *future direction of the OHSMS*. In accord with good management procedures, senior management is expected to give direction to implementing the changes needed in safety and health management processes to continually reduce risks. The standard requires that *results and action items from the management reviews shall be documented and communicated to affected individuals, and tracked to completion*. This provision gives the necessary importance to the management review process. Action items are to be recorded, communicated to those affected, and followed through to a proper conclusion.

## ADVISORY CONTENT AND APPENDICES

This standard provides a large amount of exceptionally valuable explanatory and supportive data in the advisory column—the E column—and in the Appendices. With respect to the quantity of text, information in the E column exceeds the “shall” requirements of the standard by about one-half.

Pages 1 through 29 pertain to the requirements of the standard and the material in the advisory column. Pages 30 through 88 are devoted to the appendices. That’s about a 65 % increase over the 2005 version in space devoted to appendices. A safety professional must have a copy of the standard to appreciate the value of the guidance material in the E column and the appendices.

Particular mention is made of one of the appendices because I have had to respond to many questions pertaining to how Z10 compares to other standards. Appendix N (Informative) is entitled “Management System Standard Comparison (Introduction).” The Introduction reads as follows.

*This table compares ANSI/AIHA® Z10 with international standards, and other guidelines. The matrix is intended to demonstrate the significant similarity in essential elements of management systems and assist organization in integrating management systems during implementation. Element by element comparison is difficult and check marks simply indicate that the element is present in a standard or document. This is particularly true in the case of ISO 9001-2008 because the purpose of this standard is significantly different than the other management system standards and guidelines listed in this matrix.*

In Appendix N the content of ANSI Z10 is compared to:

ISO 14001:2004  
BS OHSAS 18001:2007  
ILO-OHSMS:2001  
VPP 2008  
ISO 9001:2008

In rather small print, the table fills four pages. This is a valuable document. Whoever put it together had to spend many hours to complete it.

## CONCLUSION

This standard, from its first issue, represents an important step in the evolution of the practice of safety. Realistically, it can be expected that over time it will become the benchmark against which safety and health management systems will be measured. As the quality of such systems improves, it is logical to expect that the frequency and severity of occupational injuries and illnesses will be reduced.

It would be folly for safety professionals to ignore the long-range impact that Z10 will have on societal expectations concerning the quality of the safety management systems that employers have in place and on the expectations that employers will have concerning the knowledge and capabilities of their safety staffs.

Prudent safety professionals will study the requirements of the standard to determine whether additional skills and capabilities are needed and will move forward to acquire those skills. Having done so, they will be equipped to give guidance to managements on putting in place safety management system elements that may not exist in the organizations to which they give counsel.

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