Management of Change

Examples From Practice

By Fred A. Manuele

Management of change (MOC) is a commonly used technique. Its purpose is to:

- Identify the potential consequences of a change.
- Plan ahead so that counter actions can be taken before a change occurs and continuously as the change progresses.

With respect to operational risks, the process ensures that:

- Hazards are identified and analyzed, and risks are assessed.
- Appropriate avoidance, elimination or control decisions are made so that acceptable risk levels are achieved and maintained throughout the change process.
- New hazards are not knowingly introduced by the change.
- The change does not negatively affect previously resolved hazards.
- The change does not increase the severity potential of an existing hazard.

This process is applied when a site modifies technology, equipment, facilities, work practices and procedures, design specifications, raw materials, organizational or staffing situations, and standards or regulations. An MOC process must consider:

- safety of employees making the changes;
- safety of employees in adjacent work areas;
- safety of employees who will be engaged in operations after changes are made;
- environmental aspects;
- public safety;
- product safety and quality;
- fire protection so as to avoid property damage and business interruption.

OSHA's (1992) Process Safety Management Standard (29 CFR 1910.119) requires that covered operations have an MOC process in place. No other OSHA regulation contains similar requirements, although the agency does address MOC in an information paper (OSHA, 1994). Also, this subject is a requirement to achieve designation in OSHA's Voluntary Protection Programs.

Establishing the Need

Three studies establish that having an MOC system as an element within an operation's risk management system would serve well to reduce serious injury potential. This author reviewed more than 1,700 incident investigation reports, mostly for serious injuries, that support the need for and the benefit of an MOC system. These reports showed that a significantly large share of incidents resulting in serious injury occurs:

- when unusual and nonroutine work is being performed;
- in nonproduction activities;
- in at-plant modification or construction operations (e.g., replacing an 800-lb motor on a platform 15 ft above the floor);

IN BRIEF

- **Studies and statistics indicate that an effective management of change (MOC)/prejob planning component within an operations risk management system reduces the potential for serious injuries.**
- **Specific guidelines from practice can help SH&E professionals initiate and utilize an MOC system.**
- **Real-world examples of MOC systems in place for other than chemical operations are discussed (and available through *PS* Extra). SH&E professionals can reference these examples when developing an MOC system to suit particular operational needs.**

Fred A. Manuele, P.E., CSP, is president of Hazards Limited, which he formed after retiring from Marsh & McLennan where he was a managing director and manager of M&M Protection Consultants. His books include *Advanced Safety Management: Focusing on Z10 and Serious Injury Prevention, On the Practice of Safety, Innovations in Safety Management: Addressing Career Knowledge Needs,* and *Heinrich Revisited: Truisms or Myths.* A professional member of ASSE's Northeastern Illinois Chapter and an ASSE Fellow, Manuele is a former board member of ASSE, NSC and BCSP.

Having an effective MOC system will reduce the probability of serious injuries and fatalities.

•during shutdowns for repair and maintenance, and startups;

•where sources of high energy are present (electrical, steam, pneumatic, chemical);

•where upsets occur (situations going from normal to abnormal).

Having an effective MOC system will reduce the probability of serious injuries and fatalities occurring in these operational categories.

A 2011 study by Thomas Krause and colleagues produced results that support MOC systems as well. Seven companies participated. Shortcomings in prejob planning, another name for MOC, were found in 29% of incidents that had serious injury or fatality potential. Focusing on reducing that 29%, a noteworthy number, is an appropriate goal. (Data based on personal communication. BST is to publish a paper including these data.)

In personal correspondence, John Rupp of United Auto Workers (UAW) confirmed the continuing history with respect to fatalities occurring in UAW-represented workplaces. According to Rupp, from 1973 through 2007, 42% of fatalities involved skilled-trades workers, who represent about 20% of UAW membership. Rupp also reported that from 2008 through 2011, 47% of fatalities involved skilled-trades workers. These workers are not performing routine production jobs. They often perform unusual and nonroutine work, in-plant modification or construction operations, shutdowns for repair and maintenance, start-ups and near sources of high energy. An MOC (or prejob planning) system would be beneficial for such activities.

Assessing the Need for a Formalized MOC System

Studying an organization's incident experience and that of its industry can produce useful data on the need for a formalized MOC system. Workers' compensation claims experience can be a valuable resource as well.

To develop meaningful and manageable data, an SH&E professional should execute a computer run of an organization's claims experience covering at least 3 years to identify all claims valued at $25,000 or more, paid and reserved. If experience in other organizations is a guide, this run will likely encompass 6% to 8% of the total number of claims and 65% to 80% of the total costs.

Data analysis should identify job titles and incidents that have occurred during changes, and indicate whether a formalized MOC system is needed. Industry experience that may be available through a trade association or similar industry group also should be reviewed. Finding that few incidents resulting in serious injury occurred when changes were being made should not deter an SH&E professional from proposing that the substance of an MOC system be applied to particular changes which present serious injury potential.

Experience Implies Opportunity

To test whether personnel in operations other than chemical sites had recognized the need for and developed MOC systems, the author queried members of ASSE's Management Practice Specialty. The response was overwhelmingly favorable, and the number of example documents received was more than could be practicably used.

Examples received demonstrate that management in various operations has recognized the need for MOC systems. Eight systems selected from this exercise and two previously available are presented as examples in this article. Due to space restrictions, of the 10, one is printed on p. 41, and all are posted at **www.asse.org/psextra**.

These select examples show:

•the broad range of harm and damage categories covered;

•similarities in the subjects covered;

•the wide variation in how those subjects are addressed.

These examples reflect real-world applications of MOC in nonchemical operations. They display how such systems are applied in practice.

History Defines Needs & Difficulties of Application

At least 25 years ago, the chemical and process industries recognized the importance of having an MOC process in place as an element within an operational risk management system. That awareness developed because of several major incidents that occurred when changes were taking place.

In 1989, Center for Chemical Process Safety (CCPS) issued *Guidelines for Technical Management of Process Safety* which included an MOC element. In 1993, Chemical Manufacturers Association published *A Manager's Guide to Implementing and Improving Management of Change Systems*.

In 2008, CCPS issued *Guidelines for Management of Change for Process Safety*, which extends the previous publications. From the preface:

> The concept and need to properly manage change are not new; many companies have implemented management of change (MOC) systems. Yet incidents and near misses attributable to inadequate MOC systems, or to subtle, previously unrecognized sources of change (e.g., organizational changes), continue to occur.
>
> To improve the performance of MOC systems throughout industry, managers need advice on how to better institutionalize MOC systems within their companies and facilities and to adapt such systems to managing nontraditional sources of change. (p. xiii)

Note that incidents and near misses (near hits) attributable to inadequate MOC systems continue to occur. Also, organizational changes are being recognized as a previously unrecognized source from which MOC difficulties could arise. As noted by CCPS (2008), "Management of change is one of the most important elements of a process safety management system" (p. 1).

MOC Requirements in Standards & Guidelines

Several standards and guidelines require or suggest that an MOC process be instituted, including:

•ANSI/AIHA Z10-2005, American National Standard for Occupational Health and Safety Management Systems, which requires that an MOC process be implemented (Section 5.1.2).

•BS OHSAS 18001:2007, Occupational Health and Safety Management Systems Requirements, which states, "For the management of change, the organization shall identify the OH&S hazards, and OH&S risks . . . prior to the introduction of such changes" (Section 4.3.1).

•OSHA comments on change analysis in its Safety and Health Management System eTool: Worksite Analysis.

> Anytime something new is brought into the workplace, be it a piece of equipment, different materials, a new process or an entirely new building, new hazards may unintentionally be introduced. Any worksite change should be analyzed thoroughly beforehand because this analysis helps head off problems before they develop.

Provisions that require MOC systems may have different names. For example, Section 7.3.7 of ANSI/ASQ Q9001-2000, Quality Management Systems: Requirements, is titled "Control of design and development changes." It states:

> Design and development changes shall be identified and records maintained. The changes shall be reviewed, verified and validated, as appropriate, and approved before implementation. The review of design and development changes shall include evaluation of the effect of the changes on constituent parts and product already delivered. Records of the results of the review of changes and any necessary actions shall be maintained.

The MOC Process

As with all management systems, an administrative procedure must be written to communicate what the MOC system encompasses and how it should operate. The system should be designed to be compatible with the organization's and industry's inherent risks; management systems in place; organizational structure; dominant culture; and expected workforce participation.

Although brevity is the goal, several subjects should be considered for inclusion in an MOC procedure:

1) Define the need for and the purpose of an MOC system.

2) Establish accountability levels.

3) Specify criteria that will trigger formal change requests.

4) Specify how personnel will submit change requests and what form will be used.

5) Outline criteria for request reviews, as well as responsibilities for those reviews.

6) Indicate that the MOC system encompasses:
- •risks to those performing the work and other affected employees;
- •possible property damage and business interruption;
- •possible environmental damage;
- •product safety and quality;
- •procedures to accomplish the change;
- •results evaluation.

7) Establish that minute-by-minute control must be maintained to achieve acceptable risk levels, and that risk assessments will be made as often as needed while work progresses; this will involve giving instruction on needed action if unanticipated risks of concern are encountered.

8) Identify who will accept or decline a change request, including an MOC approval form.

9) Outline a method to determine the actions necessary because of the effect of changes (e.g., providing more employee training; revising standard operating procedures and drawings; updating emergency plans).

10) Indicate that work will receive a final review before startup of operations, and identify the titles of those who will conduct the review.

Responsibility Levels

In drafting an MOC system, responsibility levels must be defined and must align with an entity's organizational structure. This is a critical step in developing an MOC system. If even minor process changes are considered critical with respect to employee injury and illness potential, possible environmental contamination, and product quality and safety, then the levels of responsibility are often many. Some systems used as examples in this article clearly establish responsibility levels, while others do not.

Examples of responsibility levels, as outlined in an organization where inherent hazards require close control, are provided as reference points.

•**Initiator:** The initiator owns the change and is responsible for initiating the change request form. Based on complexities of the changes, these responsibilities may be reassigned at any time. The initiator fully describes and justifies changes; ensures that all appropriate departments have assessed changes; manages execution of the change request; and ensures that the changes are implemented properly.

•**Department supervisor:** The department supervisor assigns qualified personnel to initiate change requests. The change control process is critical to employee safety, as is avoiding environmental contamination and ensuring product quality. This supervisor ensures that the change request is feasible and adequately presented for review.

•**Document reviewers:** Document reviewers assess and approve change request forms. These activities include reviewing the document for accuracy and adequacy with respect to proposed changes.

•**Approvers:** Department managers should select preapprovers with expertise related to the nature of the proposed change. Based on knowledge and expertise, each reviewer will evaluate and assess the effect of the proposed change on existing processes in his/her area of expertise. Reviewers also must review and approve the change request form and the implementation plan to evaluate the

change and ensure that the steps for implementation are appropriate. This is the final review before the proposed change is implemented.

•**Postimplementation approvers:** Department managers should select postimplementation approvers who should ensure that the change has been appropriately implemented as indicated when approval for the requested change was given. This process also ensures that only the changes shown on the change request form have been implemented.

The MOC Process: Activities to Consider

An organization's hazard and risk complexities and the desire to establish an adequate yet not complex MOC system should be considered when identifying activities that will activate that system. Activity categories may include the following:

•Nonroutine and unusual work is to be performed.

•Work exposes workers to sources of high energy.

•Maintenance operations for which prejob planning and safety reviews would be beneficial because of inherent hazards.

•Substantial equipment replacement work.

•Introduction of new or modified technology, including changes to programmable logic controllers.

•Modifications are made in equipment, facilities or processes.

•New or revised work practices or procedures are introduced.

•Design specifications or standards are changed.

•Different raw materials will be used.

•Safety and health devices and equipment will be modified.

•The site's organizational structure changes significantly.

•Changes in staffing levels that may affect operational risks.

•Staffing changes require a review of skill levels.

•The site changes how it uses contractors.

MOC Request Form

An MOC request form is needed, and its content should align with an organization's structure and in-place management systems (e.g., capital request procedures, work orders, purchasing procedures). Creating a digital form allows flexibility for descriptive data and comments. The form should include:

•name of person initiating the request;

•date of request;

•department or section or area;

•equipment, facility or processes affected;

•brief description of proposed change and what will be accomplished;

•potential performance and SH&E considerations;

•titles and names of personnel who will review the change;

•effect on standard operating procedures, maintenance, training and similar functions;

•space for reviewers to document special conditions or requirements;

•approvals and authorizations;

•routing indicators or provisions for copies to be sent to personnel responsible for training and updating operating procedures, drawings and similar documents.

Sample change request forms can be found in some of the 10 examples posted in *PS* Extra (**www.asse.org/psextra**).

Implementing the MOC Process

Senior management and safety professionals must appreciate the magnitude of the task of initiating and implementing an MOC system, and should expect push-back. Common obstacles include egos, territorial prerogatives, the current power structure and normal resistance to change; remember, those affected may have had little experience with the administrative systems being proposed. Although MOC systems have been required in the chemical industries for many years, the literature reports that their application has experienced difficulties. According to CCPS (2008):

> Even though the concept and benefits of managing change are not new, the maturation of MOC programs within industries has been slow, and many companies still struggle with implementing effective MOC systems. This is partly due to the significant levels of resources and management commitment that are required to implement and improve such systems. MOC may represent the biggest challenge to culture change that a company faces. (p. 10)

> Developing an effective MOC system may require evolution in a company's culture; it also demands significant commitment from line management, departmental support organizations, and employees. (p. 11)

Management commitment, evidenced by providing adequate resources and the leadership required to achieve the necessary culture change, must be emphasized. Stated or written management commitment that is not followed by providing the necessary resources is not management commitment. Because of extensive procedural revisions necessary when initiating an MOC system, culture change methods should be applied. Subjects to consider when implementing the system include the following:

•Management commitment and leadership must be obtained and demonstrated. That means providing personal direction and involvement in initiating procedures; providing adequate resources; and making appropriate decisions with respect to safety when disagreement arises about the change review process.

•Keep procedures as simple as practicable. An applied, less-complicated system achieves better results than an unused complex system.

•Obtain widespread acceptance and commitment. Inform all affected employees before initiating the MOC system, solicit their input, and respect their perspectives and concerns.

•Recognize the need for and provide necessary training.

•Field-test a system before implementing it. Debugging will produce long-term returns.

•After refining the system through a field test, select a job or an activity that would benefit—both productivity/efficiency and safety—from an MOC system, and emphasize those benefits to build favorable interest. Testing the system in a select activity demonstrates its value, makes it credible and creates demand for additional applications.

•Monitor system progress and performance via periodic audits, and informally ask employees for their perspectives.

Managing Organizational Change

In some examples posted, procedures require those involved to assess the significance of organizational changes. These provisions exist because organizational and personnel changes can negatively affect an operational risk management system.

Of the considerable literature on the subject, Managing the Health and Safety Impacts of Organizational Change (CSChE, 2004) is cited because it fits closely with the intent of some examples provided. Types of organizational and personnel changes that can negatively affect operations risk management are:

Figure 1

Risk Assessment Matrix

Severity levels and values	Occurrence probabilities and values				
	Unlikely (1)	Seldom (2)	Occasional (3)	Likely (4)	Frequent (5)
Catastrophic (5)	5	10	15	20	25
Critical (4)	4	8	12	16	20
Marginal (3)	3	6	9	12	15
Negligible (2)	2	4	6	8	10
Insignificant (1)	1	2	3	4	5

Note. *Numbers were intuitively derived. They are qualitative, not quantitative. They have meaning only in relation to each other.*

Incident or Exposure Severity Descriptions

Catastrophic: One or more fatalities, total system loss and major business down time, environmental release with lasting effect on others with respect to health, property damage or business interruption.

Critical: Disabling injury or illness, major property damage and business down time, environmental release with temporary impact on others with respect to health, property damage or business interruption.

Marginal: Medical treatment or restricted work, minor subsystem loss or property damage, environmental release triggering external reporting requirements.

Negligible: First-aid or minor medical treatment only, nonserious equipment or facility damage, environmental release requiring routine cleanup without reporting.

Insignificant: Inconsequential with respect to injuries or illnesses, system loss or downtime, or environmental release.

Incident or Exposure Probability Descriptions

Unlikely: Improbable, unrealistically perceivable.

Seldom: Could occur but hardly ever.

Occasional: Could occur intermittently.

Likely: Probably will occur several times.

Frequent: Likely to occur repeatedly.

Risk Levels: Combining the severity and occurrence probability values yields a risk score in the matrix. The risks and the action levels are categorized below.

Risk Categories, Scoring & Action Levels

Category	Risk score	Action level
Low risk	1 to 5	Remedial action discretionary.
Moderate risk	6 to 9	Remedial action to be taken at appropriate time.
Serious risk	10 to14	Remedial action to be given high priority.
High risk	15 or greater	Immediate action necessary. Operation not permissible except in an unusual circumstance or as a closely monitored and limited exception with approval of the person having authority to accept the risk.

The culture change necessary to implement a successful MOC system is impossible without a training program that helps supervisors and workers understand the concepts to be applied.

- reorganizing or reengineering;
- workforce downsizing;
- attrition and workforce aging;
- outsourcing of critical services;
- changes affecting the competence or performance of contractors that provide critical services (e.g., equipment design, process control software, hazard and risk assessment);
- loss of skills, knowledge or attitudes as a result of the cited changes.

According to CSChE (2004), such changes are not as well-addressed in applicable guidelines as changes in equipment, tools, work methods and processes.

More emphasis must be given to the effect of organizational changes on operational risk management because incident reports on some serious injuries and fatalities indicate that staffing reductions were a significant contributing factor to unacceptable risk situations such as inadequate maintenance; inadequate competency; workers being stressed beyond their mental and physical capabilities (e.g., two persons doing the work for which three had been previously assigned; a person working alone in a high-hazard situation for which the standard operating procedure calls for a work buddy).

Risk Assessments

Some of the examples posted require risk assessments at several stages of the change activity. The intent is to achieve and maintain acceptable risk levels throughout the work. Thus, risk assessments should be conducted as often as needed as changes occur—and particularly when unexpected situations arise. SH&E professionals who become skilled risk assessors can offer a significant value-added consultancy.

Risk assessment is the core of ANSI/ASSE Z590.3, Prevention Through Design: Guidelines for Addressing Occupational Hazards and Risks in Design and Redesign Processes. The standard's content is applicable to MOC whether the contemplated change involves new designs or redesign of existing operations. Of particular interest are sections on supplier relationships, safety design reviews, hazard analysis and risk assessment processes and techniques, and the hierarchy of controls.

Risk Assessment Matrixes

Z590.3 recommends use of a risk assessment matrix, and stresses that all involved agree on the definitions of terms used in the matrix. An addendum in Z590.3 provides several sample matrixes. The example presented in Figure 1 (p. 39) was preferred by operating employees involved in the risk assessment process. They indicated that first establishing a mental relationship between numbers such as 6 and 12 helped them more readily understand the relation between terms such as *moderate risk* and *serious risk*.

The Significance of Training

CCPS (2008) emphasizes the significance of training in achieving a successful MOC system:

> Training for all personnel is critical. Many systems failed or encountered severe problems because personnel did not understand why the system was necessary, how it worked and what their role was in the implementation. (p. 58)

The culture change necessary to implement a successful MOC system is impossible without a training program that helps supervisors and workers understand the concepts to be applied. Where the MOC system applies to many risk categories (occupational, public, environmental, fire protection and business interruption, product quality and safety), training must be extensive.

Documentation

An operation must maintain a history of operational changes. All modifications must be recorded in drawings, prints and appropriate files; they become the historical records that would be reviewed when future changes are made.

Comments that "changes made were not recorded in drawings, prints and records" are too common in reports on incidents with serious consequences. Examples of unrecorded changes include the following:

- The system was rewired.
- A blank was put in the line.
- Control instruments were disconnected.
- Relief valves of lesser capacity had been installed.
- Sewer line sensors to detect hazardous waste were removed.

On the MOC Examples

As noted, the 10 MOC examples covered in the following discussion are posted in the *PS* Extra section of the ASSE website (**www.asse.org/psextra**).

To demonstrate the substance and variety of actual MOC systems, few changes were made in the examples. In some cases, terms used are not readily understandable. However, these terms are likely understood within the organization that developed the system, so they are presented as-is to emphasize that the terminology included in an MOC procedure must reflect the language commonly used within an organization and must be understood by all involved in an MOC initiative.

These examples vary greatly in content and purpose. Some are one page; others take several pages to cover the complexity of procedures and exposures. Some procedures have introductory statements on policy and procedure, others do not. Nevertheless, these examples show that an MOC system need not meet a theoretical ideal to provide value. These examples are intended as references; none should be adopted as is. An MOC system should reflect an organization's particular needs and its culture.

Example 1: Producing Mechanical Components

This prejob planning and safety analysis system

(Figure 2) is a one-page outline developed because of adverse occupational injury experience in work that was often unusual or one-of-a-kind, or that required extensive, complex maintenance.

It is relatively simple in relation to other examples posted, yet it was successfully applied for its purposes. In this case, safety professionals:

- prepared the data necessary to convince management and shop floor personnel to try the proposed system;
- reported that training was highly significant in achieving success;
- emphasized that work situations discussed in training were real to that organization;
- addressed productivity/efficiency and risk control benefits in their proposal and during training.

For whoever initiates an MOC system, the following procedure will be of interest.

At a location where the serious injury experience was considered excessive for nonroutine work, safety professionals decided that something had to be done about it. As they prepared a course of action and talked it up at all personnel levels, from top management down to the worker level, they encountered the usual negatives and push-back (e.g., it would be time consuming, workers would never buy into the program, supervisors would resist the change). The safety professionals considered the negatives as normal expressions of resistance to change.

Their program consisted of, in effect, in-

Figure 2

MOC Example 1

Alpha Corporation

Pre-Job Planning and Safety Analysis Outline

1) Review the work to be done. Consider both productivity and safety:
   a) Break the job down into manageable tasks.
   b) How is each task to be done?
   c) In what order are tasks to be done?
   d) What equipment or materials are needed?
   e) Are any particular skills required?
2) Clearly assign responsibilities.
3) Who is to perform the pre-use of equipment tests?
4) Will the work require: a hot work permit; a confined entry permit, lockout/tagout (of what equipment or machinery), other?
5) Will it be necessary to barricade for clear work zones?
6) Will aerial lifts be required?
7) What personal protective equipment will be needed?
8) Will fall protection be required?
9) What are the hazards in each task? Consider:

• Access	• Explosion	• Noise	• Weather
• Chemicals	• Fall Hazards	• Pressure	• Weight of objects
• Conveyors	• Fire	• Sharp objects	• Welding
• Dropping tools	• Forklift trucks	• Steam	• Work at depths
• Dusts	• Hot objects	• Stored energy	• Work at heights
• Electricity	• Machine guarding	• Twisting, bending	• Worker position
• Elevated loads	• Moving equipment	• Vibration	• Worker posture

10) Of the hazards identified, do any present severe risk of injury?
11) Develop hazard control measures, applying the Safety Decision Hierarchy.
   - Eliminate hazards and risks through system and work methods design and redesign
   - Reduce risks by substituting less hazardous methods or materials
   - Incorporate safety devices (fixed guards, interlocks)
   - Provide warning systems
   - Apply administrative controls (work methods, training, etc.)
   - Provide personal protective equipment
12) Is any special contingency planning necessary (people, procedures)?
13) What communication devices will be needed (two-way, hand signals)?
14) Review and test the communication system to notify the emergency team (phone number, responsibilities).
15) What are the workers to do if the work doesn't go as planned?
16) Considering all of the foregoing, are the risks acceptable? If not, what action should be taken?

Upon Job Completion

17) Account for all personnel
18) Replace guards
19) Remove safety locks
20) Restore energy as appropriate
21) Remove barriers/devices to secure area
22) Account for tools
23) Turn in permits
24) Clean the area
25) Communicate to others affected that the job is done
26) Document all modifications to prints and appropriate files

PS EXTRA

To view and download each of the 10 MOC examples cited, visit www.asse.org/psextra.

doctrinating management and the workforce in the benefits to be obtained by doing prereviews of jobs so that the work could be done effectively and efficiently while at the same time controlling the risks.

Eventually, management and the line workers agreed that classroom training sessions could be held. Later, the safety professionals said that the classroom training sessions and follow-up training were vital to their success.

At the beginning of each of those sessions, a management representative introduced the subject of prejob planning and safety analysis and discussed the reasons why the new procedure was being adopted. Statistics on accident experience prepared by safety professionals were a part of that introduction. Then, safety professionals led a discussion of the outline shown in MOC Example 1. It set forth the fundamentals of the prejob review system being proposed. After discussion of those procedures, attendees were divided into groups to plan real-world scheduled maintenance jobs that were described in scenarios that had been previously prepared.

At this location, supervisors took to the prejob planning and safety analysis system when they recognized that the system made their jobs easier, improved productivity/efficiency, and reduced the risks. And they took ownership of the system. As one of the safety professionals said, "Our supervisors and workers have become real believers in the system." And a culture change had been achieved.

Note the requirements under the caption "Upon Job Completion." The detail of the requirements reflects particular incidents with adverse results that occurred over several years. Every MOC system should include similar procedures to be followed before work can be considered completed.

Example 2: Specialty Construction Contractor

This two-page field work review and hazard analysis system was provided by a safety professional employed by a specialty construction contractor that has several crews active in various places at the same time. Note that the names of employees on a job must be documented as having been briefed on the work to be performed. The checklist included in this example pertains to occupational, public and environmental risks.

When asked what drove development of the change procedure, the safety professional said the firm had learned from costly experience. According to this professional, the procedures required by the change system are now embedded in the company's operations and are believed to have resulted in greater efficiency. In addition, fewer costly incidents have occurred.

This example has a direct relation to the purposes of construction/demolition standard ANSI/ASSE 10.1, Pre-Project and Pre-Task Safety and Health Planning. This standard is an excellent resource for contractors and companiess that establish requirements for on-site contractors. Note the distinctions: preproject planning and pretask planning.

Example 3: Serious Injury Experience

This pretask analysis form emphasizes obtaining required permits and ensuring that supervisors brief employees on the order of activities and about the risks to be encountered. Employees must sign the form to confirm this briefing; it is the only example that requires employee signatures.

Example 4: Management Policy & Procedure

This basic guidance paper is condensed to three pages. It is a composite of several MOC policies and procedures issued by organizations in which operations were not highly complex. Reference is made to an MOC champion. Someone must be responsible for the change and manage it through to an appropriate conclusion.

Example 5: Specifically Defined Prescreening Questionnaire

In three pages, this system commences with an interesting prescreening questionnaire. If the answer to all questions is "no," the formal MOC checklist and approval form need not be completed. With respect to MOC systems, it's often asked, "To what work does the system apply?" This organization developed a way to answer that question for its operations.

Example 6: High-Risk Multiproduct Manufacturing

This MOC policy and procedure reflect the organization's high-hazard levels. Captions in this four-page example are: safety; ergonomics; occupational health; radiation control; security/property loss prevention; clean air regulations; spill prevention and community planning; clean water regulations; solid and hazard waste regulations; environmental, safety and health management systems; and an action item tracking instrument.

According to the procedure paper announcing the system:

> If a significant change occurs with respect to key safety and health or environmental personnel, the matter will be reviewed by the S&H manager and the environmental manager and a joint report including a risk assessment and their recommendations will be submitted to location management.

Example 7: A Food Company

This four-page policy includes product safety and quality as subjects to be considered. The safety director reports that discipline in the application of this MOC system is rigid, which reflects management's determination to avoid damaging incidents and product variations. Provisions for prestart-up and postmodification are extensive. Risks are assessed after changes are made and before start-up.

Example 8: Conglomerate

Iota Corp. has a five-page MOC procedure outlined in four sections. Section I requires completion of a change request and tracking system requirements form in which the change is described, a tracking number is assigned and approval levels are established. Approval levels are numerable, including headquarters in some instances.

Section II outlines a change review and approval procedure that is extensive with respect to occupational safety, health and environmental concerns. Section III is a preimplementation action summary form that lists subjects for which actions are necessary before change can begin, and it identifies those responsible for those actions. Section IV lists 11 points in a postcompletion form.

Example 9: Extensive System for a Particular Operation

This seven-page example is valuable because of its structure and content. It is somewhat different compared to the other examples. It:

- handles requirements for technical changes and organizational changes separately and extensively;
- stresses organizational changes for which risk assessments are required;
- outlines in detail technical changes to which the standard applies;
- lists risk assessment as a separate item that pertains to all operations;
- includes a lengthy discussion of general considerations, and outlines and thoroughly discusses requirements for a six-point MOC standard: management process; capability; change identification; risk management; change plan; and documentation.

This is a concept and procedural paper. It does not include the forms used to implement the various procedures.

Example 10: International Multioperational Entity

Application of this system, titled Management of Change Policy for Safety and Environmental Risks, extends the activities of SH&E professionals beyond that of any other example. It covers 10 pages, although the bulletin issued by the safety entity within the organization is much longer.

Only two of five exhibits were made available because of proprietary reasons. Unique aspects include the following:

- Due diligence is included in a list of definitions. SH&E professionals are to assess acquisitions and similar transactions.
- Global franchise management board members are listed under responsibilities. They are to ensure compliance with the standard.
- A preliminary SH&E assessment questionnaire shall be initiated during the project planning stage.
- A section titled Evaluating Change (Risk Assessment Guidelines) includes these subjects, which may not be included in other examples, at least not as extensively:
  a) new process product and development;
  b) capital/noncapital project;
  c) external manufacturing;
  d) business acquisitions;
  e) significant downsizing/hiring.
- Conducting risk analyses is a major section.

This example is noteworthy because of its breadth. Interestingly, the system was issued by the safety and industrial hygiene unit, which implies management support for superior operational risk management.

Conclusion

This article has provided a primer that SH&E professionals can use to craft an organization-specific MOC/prejob planning system. Safety professionals should consider whether their employers could benefit from having such a system in place. Having a system that prestudies changes because of their inherent hazards and risks and their potential effect on safety, productivity and environmental controls is good risk management. **PS**

References

American Society for Quality (ASQ). (2000). Quality management systems: Requirements (ANSI/ASQ Q9001-2000). Milwaukee, WI: Author.

ANSI/ASSE. (2011). Construction and demolition operations: Preproject and pretask safety and health planning (ANSI/ASSE A10.1-2011). Des Plaines, IL: Author.

ANSI/ASSE. (2011). Prevention through design: Guidelines for addressing occupational hazards and risks in design and redesign processes (ANSI/ASSE Z590.3-2011). Des Plaines, IL: Author.

Canadian Society of Chemical Engineering (CSChE). (2004). Managing the health and safety impacts of organizational changes. Ottawa, Canada: Author. Retrieved from **www.cheminst.ca/index.php?ci_id=3210&la_id=1**.

Center for Chemical Process Safety (CCPS). (2008). *Guidelines for management of change for process safety*. Hoboken, NJ: American Institute of Chemical Engineers, Author.

Chemical Manufacturers Association. (1983). *A manager's guide to implementing and improving management of change systems*. Washington, DC: Author.

NSC. (2000). *Aviation ground operations safety handbook* (5th ed.). Itasca, IL: Author.

OSHA. Safety and health management system eTool: Worksite analysis. Washington, DC: U.S. Department of Labor, Author. Retrieved from **www.osha.gov/SLTC/etools/safetyhealth/comp2.html**.

OSHA. (1992). Process safety management of highly hazardous chemicals (29 CFR 1910.119). Washington, DC: U.S. Department of Labor, Author.

OSHA. (1994). Process safety management guideline for compliance (OSHA Bulletin 3133). Washington, DC: U.S. Department of Labor, Author. Retrieved from **www.osha.gov/Publications/osha3133.pdf**.

Stephens, R.A. (2004). *System safety for the 21st century*. Hoboken, NJ: John Wiley & Sons.