



A Benchmark Process for Management of Change

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Introduction

Effective Management of Change (MOC) is vital for safe, reliable operations. The recommendations of the CSB's incident investigations and the CCPS process safety literature indicate that a vast number of chemical incidents are a result of poor implementation of Process Safety Management (PSM), and in part also due to issues with the operator's MOC process. Impending requirements such as the CAL OSHA proposed GISO §5189.1 are likely to have the largest regulatory impact since OSHA 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals first enacted in 1992. Organizations not only need to keep pace with regulatory changes such as these, but their MOC processes also need to cultivate learning and continuous improvement.

Sphera introduces a benchmark MOC process to address current challenges. The design has learning at its core and embeds continuous improvement to ensure changes are consistently implemented properly. An overview of the impact of the amendments to the PSM's MOC element, such as the need to include the management of organizational change (MOOC) in the existing MOC process requirements, is also provided. These updates are incorporated in the Sphera benchmark MOC process workflow chart provided in the paper.

Regulatory Evolution of MOC

The original MOC process requirement has remained largely unchanged since OSHA 1910.119 was first issued. On August 1, 2013, the Executive Order (EO) 13650 namely "Improving Chemical Facility Safety and Security" was issued in response to fatal chemical incidents including the ammonium nitrate explosion at the West Fertilizer Storage Company. As a result, OSHA issued a RFI in November 2013 for public input for improvements to the PSM standard. It identified 17 areas for improvements (see Appendix A). One of these 17 areas is the inclusion of management of organizational change as part of the MOC process. The original MOC covers five triggers for review with the exception of Replacement of Kind (RIK) changes, namely: (a) Process Chemicals, (b) Technology, (c) Equipment, (d) Procedures, and (e) Facilities. It is now proposed to include an additional trigger, (f), for Organizational Changes (such as organizational restructuring, staffing, and policies that may affect the first four triggers above) in the company's MOC.

After the BP Refinery incident in March 2005, the CSB had made a recommendation to OSHA in its incident investigation report to amend the OSHA PSM standard (not just the guidance) to require that a management of change (MOC) review be conducted for organizational changes that may impact process safety including:

- Major organizational changes such as mergers, acquisitions, or reorganizations;
- Personnel changes, including changes in staffing levels or staff experience; and
- Policy changes, such as budget cutting.

OSHA responded with a memorandum March 31, 2009, to its regional administrators

insisting that organizational change is already implied and going forward, it will be described in the guidance. The CSB recommendation was to amend in a more permanent way in the PSM regulation itself rather than just the guidance. The memorandum describes the interpretation of organizational change in PSM as follows:

Some organizational changes, such as changes resulting from mergers, acquisitions, reorganizations, staffing changes, or budget revisions, may affect PSM at the plant level and would therefore trigger a PSM MOC procedure. Some examples of these include:

- Personnel changes, including changes in staffing levels, staff experience, or contracting out that directly impact PSM covered processes; and
- Policy changes such as budget cutting that impact PSM covered processes.

In other words, changes such as a staff reduction can impact operations’ ability to use existing operating procedures properly, and should therefore trigger a MOC. Similarly, a budget reduction can impact a maintenance department’s ability to perform their activities at the required frequency and should also trigger a MOC. However, if the organizational change does not affect the PSM at the plant level, such as restructuring in the corporate office that does not impact plant level activities, then it would not trigger MOC. This is further explained through an illustration in the benchmark MOC process flowchart below.

In March of this year (2015), CAL OSHA updated their proposed Process Safety Management for Petroleum Refineries, which is a likely harbinger for broader regulation. This draft outlines specific PSSR requirements, such as performing Process Hazard Analysis, Hierarchy of Hazard Controls Analysis (HCA), Damage Mechanism Review, and Safeguard Protection Analysis for all

new processes. It also calls for HCA for all major changes, and the use of qualified personnel and appropriate methods for MOCs based upon hazard, complexity and type of change.

The Sphera Recommended Benchmark MOC Process

Due to the increasing regulatory requirements and uncertainty about the effectiveness of their own MOC processes, asset-intensive companies are asking Sphera to ensure their processes are designed and implemented appropriately. These companies want their MOC processes to include the proper steps and activities and they want these activities performed the right way by the right people every time to ensure safe, reliable changes. They want to maximize learning and avoid repeat issues.

Regulations do not specify in enough detail how an MOC process should be done, and there are many variations of MOC workflows. These variations are not only across companies, but also across facilities of the same company. Are there activities that should be standard for every MOC? What are the keys to assuring the MOC process is not only adopted by the workforce, but performed correctly and consistently? How should learning be embedded into the MOC process to make the most of successes as well as lessons-learned? To address these challenges, Sphera subject matter experts have designed the following MOC process as a benchmark – based on years of experience partnering with asset-intensive companies to design, enable, and implement MOC processes. This benchmark process emphasizes the learning purpose of the MOC process and enables knowledge-sharing and continuous improvement. Figure 1 displays the result of this design. The process steps are described in detail below, emphasizing the applicability of the steps to many types of changes.

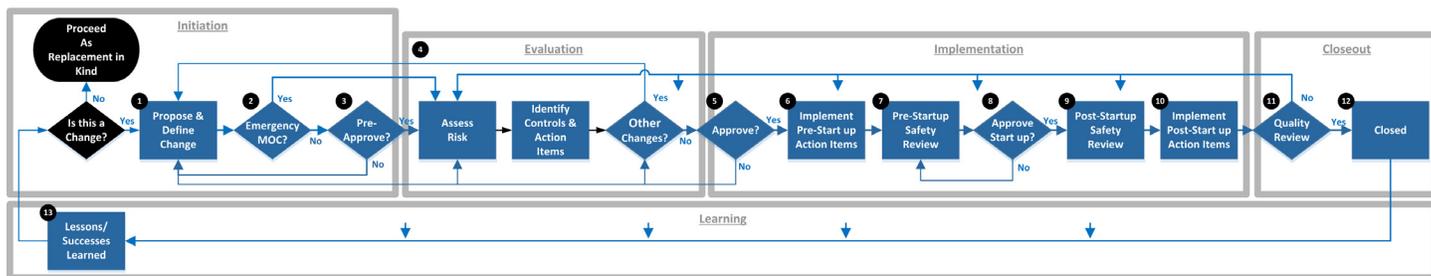


Figure 1. Refer to the appendix for an in-depth view of the workflow graphic.

Prelude: Determine if an MOC is Required

A successful MOC system enables anyone in the workforce to make suggestions for possible changes, including front-line workers. This allows you to draw on your workers' practical experience, while at the same time helping to increase employee "buy-in" into the process. OSHA recommends MOCs for any change that affects process chemicals, technology, equipment, procedures, or facilities, as well as any organizational, personnel, and policy changes that could impact these elements. An organizational change or MOOC would follow the same or similar process as other types of changes.

When changes are suggested, it's important to aid the initiator in deciding if an MOC – the formal process for managing changes – is required. A list of "pre-screen" questions can be used to qualify the change and determine the appropriate next step. For instance, the questions can help the initiator determine if the new item meets the design specifications of the item being replaced. If this is the case, the change is a replacement in kind (RIK), which would not require an MOC. As a result of this decision point, the initiator will either proceed to the next step of defining and proposing the change, or they may make the suggested change without following the MOC process. A replacement-in-kind, however, does require careful thought, definition, training, and consistent application.

Step 1: Define & Propose the Change

Once the Initiator has determined that an MOC is required, the next step is to define the change. This involves providing information to describe and show the magnitude of the change, such as: the type and category of change; a detailed description; the reason and technical basis of the change; the impacts of the change; the level of change; the modifications required; timing of change; and other similar information. Photos, drawings, and other materials are attached.

The key is to assess the change and provide clear details so that the approvers can make a decision whether or not to proceed with the change. Once verified, these details will affect the personnel involved in the MOC, the risk assessment and Pre-Start-Up Safety Review (PSSR) methods that will be used, and the approvals that will be needed.

Step 2: By-pass Approval for Emergency MOC

If in the definition step it was determined that this is an emergency change needing immediate implementation, the process should allow for administrative steps to be bypassed. The information related to who approved the emergency change and if it was approved should be captured if the change is in fact an emergency. Also, the risk of the change should still be assessed, so the process for emergency changes will continue at the Evaluation step.

Step 3: Pre-Approve MOC

MOC Approval may be done by a single person or a committee. The person or committee assesses if the proposal is worthwhile, taking into account business context, likely cost and benefits, and technical soundness. If your MOC committee meets regularly, you might want it to save all the minor changes and review them at once. When reviewing these minor changes, the committee must remember that a minor change may have major consequences.

1. If the change is approved in principle, an Evaluator is assigned to carry out the Risk Assessment, and sets the initial workflow schedule.
2. If the change is rejected, the reason for rejection is recorded and the process terminated with feedback going to the Initiator.

Step 4: Evaluation Assess Risk

Once the preliminary approval has been given, an evaluation of the proposed changes must be completed. The Evaluation process should be the most extensive phase of the MOC. The activities here are the most robust due to the fact that typically, many users are involved in the Evaluation process. This step should allow for flexibility based on the type and magnitude of the change. Major changes will benefit from collaboration from several individuals at this stage. Smaller, routine changes may be simpler and involve only a few individuals or even just the owners of the change. Regardless, the stakeholder's and SME's inputs should be easily accessible by any MOC team member. The Assess Risk step should include:

- Assessing the risk using PHA and/or some other risk assessment tool
- Setting documentation requirements
- Setting technological requirements
- Identifying any audits that must be done (Health & Safety, etc.) or permits that must be obtained
- Setting new safety limits for the process
- Costing out the changes

A standard part of the Evaluation process is a checklist in which the appropriate "stakeholders" or SMEs answer specific questions in the checklist. The checklist should include all questions which would assist in determining what needs to be considered before the change is made as well as what and who will be affected by the change. A checklist should always be included in the Evaluation process, regardless of whether or not a formal risk assessment is required. This checklist could include questions that would help the MOC Owner or person responsible for evaluating the MOC determine what type of risk assessment is required.

Another, smaller checklist could assist in determining the type of risk assessment. The risk assessments that are used should correlate with the level and potential impacts of this change. For instance, PHA and HCA may be required for major changes. Functional reviews and/or inspections may be used for lesser changes, and will be based on the type of change.

Identify Controls & Action Items

The risk assessments should produce potential consequences that are risk-rated, along with their root causes. These results should lead the review of safeguards and management system elements to determine what protection layers need to be put into place to mitigate the risk. Action Items should be assigned to implement or strengthen the protection layers needed. These actions may include pre-start-up actions (tasks that must be completed before cutover to the new state) and post-start-up actions (tasks that may be completed after cutover). Actions that need to be completed prior to approval may also need to be created. Those items could be additional Evaluation items or Action items. All actions should be connected to the MOC, and should be assigned to responsible persons with due dates.

Determine if Additional Changes are Required

As an outcome of the risk assessments, additional changes may be required to complete the change and return to safe operations. If this is the case, another MOC should be initiated (Step 1). This new, related MOC should be added as a child MOC to the original parent MOC. Below is a RACI chart showing the type of involvement required of each of the process stakeholders.

MOC Process Steps		Initiator	MOC Owner	Approver	Evaluator	Implementer	Functional SME	Action Responsible
Initiation	Initiate Change	R	C					
	Is this a Change?		R					
	Identify Type and Category		R					
	Emergency MOC?		R					
	Pre-Approve?	I	R	A				
Evaluation	Complete Evaluation Check List		R					
	Assess Risk		R	C	A	C	A	
	Identify Controls & Action Items		R	C	A	C	A	
	Other Changes?							
Implementation	Approve?		A	R	C	C		
	Implement Pre-Startup Action Items		A	I	C	R		
	Pre-Startup Safety Review		I	I	C	R		
	Approve Startup?			R				
	Post-Startup Safety Review							
	Implement Post-Startup Action Items							
	Quality Review		R					
Close out	Close		R					
	Lessons/ Successes Learned		R	A	A	A	A	A

- R** Responsible for the task being done.
- A** Accountable for the task being completed.
- C** Consulted with prior to the activity being performed.
- I** Informed that the task has been completed.

Step 5: Approve MOC for Implementation

Although this step should be primarily a technical evaluation and approval of the change, it is also a business or financial approval of the change. If business and financial approvals are also required, they can be done concurrently to the other approvals. The Approver studies the recommendations and either moves the project to the implementation step, or sends the project back for more analysis. Note that if the appropriate steps have been completed up to this point, there should not be a need to put the project on hold, or to reject it entirely.

Step 6: Implement Pre-Startup Action Items

At this step, the action items are completed by the responsible persons, and the change is implemented. Implementation may be the construction or installation of the equipment, or the training of staff and the publication of new operating procedures in a procedural change. Issues may arise during the implementation stage that may require further evaluation. Any changes to the defined scope would have to be approved. All action items marked as “pre-start-up” must be completed before progressing to the Approve Startup step.

Step 7: Pre-Start-Up Safety Review (PSSR)

The pre-start-up safety review is the chance to ensure everything has been done correctly – according to design specifications – before the change is actually made. An employee experienced with process operations and engineering of the process should perform the PSSR, typically using checklists that pertain to the type of change. Even organizational changes (MOOCs) should include a PSSR, which would verify the qualifications, permits, certifications, experience, availability, etc. of any new personnel. Any engineering drawings, P&IDs, etc. are also updated at this step.

Step 8: Approve Start-up

This is the commission of the change. It involves putting the new equipment or procedure into use. Start-up tasks include:

- Ensuring all affected personnel have been properly trained in the new process
- Informing all affected personnel that the change is now in place
- Formally approving the startup, if required

Approvers choose one of two paths as an outcome of this decision step:

1. Startup the project, which may include starting equipment, cutting over to a new process, etc.
2. Send the project back for more work

Step 9: Post-Startup Review

Some companies integrate their Post-Startup activities as part of their MOC process; other companies transfer these activities to their PSM or Operations systems. We suggest that you include your Post-Startup activities as part of your MOC process to ensure that all the work associated with the change has been carried out before the project is closed. Post-startup tasks verify items such as:

- Any additional employee training, manuals and guides have been obtained
- All the drawings and documents have been updated and uploaded
- Any new signage and safety features have been properly installed
- All necessary spare parts have been purchased
- A revised maintenance schedule has been created
- The change is operating as intended
- The records of the process and file closeout are maintained in accordance with government regulations and company policy

Step 10: Implement Post-Startup Action Items

Action items that were deemed “post-start-up” in the Evaluation phase are completed at this step. While these action items were not required for cutover to the new state, they should be completed before the MOC is closed to ensure the sustainability and on-going safety of operations.

Step 11: Quality Review

The Quality Review is a continuous improvement activity that ensures MOCs are consistently well-executed. It is an end-to-end evaluation of the MOC process, to ensure that the process was followed correctly, the right people were involved, the risks were appropriately assessed, and decisions were made with adequate information. This review should be in the form of a questionnaire to assess and score the process, and to provide visibility to leadership about how well the process is being performed. This activity not only produces additional learnings and opportunities for improvement, it also reinforces the importance of the process to the workforce, who will be compelled to improve their Quality Review scores. The outcomes of the Quality Reviews should be used to create action items to address personnel, process, and technology gaps for MOC and PSM processes.

Step 12: Close MOC

This recommended workflow is scalable and adaptable and covers all essential steps – initiation, risk assessment, implementation and start-up – with formal review steps to ensure that all the potential and actual hazards have been properly addressed. When the above steps are followed, the project can be confidently closed out. The MOC should be retained for future analyses and learning, and as documentation for regulatory reviews and audits.

Step 13: Lessons-Learned

The overarching purpose of the MOC process should be to learn and take preventive action based on the learning. Learning should take place throughout each change, and the learnings should be applied not only for an individual change, but to the MOC process as a whole, and to all applicable areas of the organization where the related controls need to be strengthened. Therefore, learning is embedded into the model MOC process -- not as a single step, but as an integrated process. MOC initiators, Owners, Evaluators, approvers, Evaluators, and any other stakeholders involved in the MOC process should be encouraged to identify and document lessons-learned at any point in the process. A simple checklist can be used to uncover learning opportunities – including not only risky items and mistakes that should be corrected, but also successes that should be replicated. The information system should allow learnings to be documented in a way that they can be used independently of a specific MOC. These lessons-learned should then be submitted into a corporate learning process for review, categorization, and distribution to applicable areas of the organization. To close the loop, the recipients of these learnings should be held accountable to generate preventive actions to close gaps in controls and/or improve their local PSM and MOC process activities.

Implementing an Enterprise MOC Solution

Criteria for gap analysis of your company's MOC workflow

It is important that you define the scope of your MOC process and there are three things that must be included in your specifications:

1. The physical areas in your facility that are covered by your MOC protocols.
2. The type of changes that are to be covered by your MOC system. These changes could include operations and technology, process equipment, procedural, policy, organizational, some personnel and site equipment.
3. The variations of workflows needed. Is your process going to cover temporary and emergency types of change? If so, how will they be covered? Will there be a

separate workflow for each type? Will there be different workflows based on each site's level of maturity? Is there a maximum amount of time for a temporary change before it has to be either re-evaluated or removed? What documents will be required for your process?

Success factors and challenges of a typical MOC implementation project

An MOC system can be simple to design, but it is difficult to implement for several reasons:

- Most facilities, even within the same company, design their own MOC process
- Gaps typically exist in existing systems where paperwork can get lost
- The MOC process is rigorous, so, it can be cumbersome or not user-friendly and people may attempt to reject or bypass the process
- Complete and consistent engagement of all the various roles involved in the program can be difficult to achieve

Successful MOC programs require solid and visible leadership – typically from an executive sponsor such as the VP of Operations. Safe, reliable changes do not typically occur from the ground-up, especially in larger organizations. The initiative will need corporate sponsorship of a global, cross-functional team, a standard, enterprise-wide process, and a risk management information system that is designed to enable and integrate such processes.

In order for your process to be adopted, you need to have good employee engagement throughout the implementation. Site-level resources should be included in MOC process design and implementation decisions, along with the corporate team. Open and targeted communication, training, and incentives will ensure continuous engagement of the workforce. For instance, as an MOC progresses through its life cycle, is important that the initiator and other roles are made aware of the progress. If your employees feel that there is no management support of the MOC process, they may likely not suggest any further improvements and employee participation in the process will drop as a result.

Finally, design the MOC process for the entire enterprise, and then adjust the process for site-level requirements as needed. The general consensus based on our experience with global deployments is to first standardize the MOC process enterprise wide including across the individual sites. With that said, the workflow should be agile enough to allow some of the process to be site-specific, if required. The bulk of the agility and flexibility is typically in the Evaluation phase. In both large and smaller corporate MOC enterprise system implementations, some organizations allow site-specific Evaluation and PSSR checklists while others require all sites to use the same Evaluation

and PSSR checklists. As a general recommendation for an enterprise MOC solution, all sites within an organization should consider both the same workflow process and the layout of the task forms, but each site can still have their own content in the forms specific to their tasks. In global deployments of MOC systems, there is typically no one-size-fits all process, even within one company, due to variations in maturity levels and site operations. For example, a non-PSM site may not be required to trigger a PHA risk assessment during Evaluation phase whereas it may be mandatory at a PSM site. Ensure that the process is fit for purpose and that the sites are prepared to adopt it and perform it as their own. We recommend as best practice that a MOC process be standardized around a common workflow with specific applicability at the site level such as site specific checklists. Sphera MOC technologies offers these capabilities.

The purpose of an MOC system is to enable the MOC process from beginning to end, and to establish the procedures necessary to ensure that the health and safety as well as operational risks arising from proposed changes are managed properly. To their detriment, many companies manage their MOC business process in a variety of ways: paper; document management solutions; site level applications; spreadsheets; etc. The value of enabling the MOC process in an single, enterprise-wide application is the visibility it provides to all levels of management to how well (or poorly) the company as a whole is managing change throughout the organization. A well-designed and implemented MOC system enables companies to drive correctness and consistency in the execution of MOCs throughout the organization. The system can automate the evaluation, authorization and documentation of changes before they are made, and ensure proper implementation of the change, appropriate closure, and valuable learning after the changes are made. Through the right information system, all aspects of the MOC process can be measured, monitored and improved.

Integration of the new MOC process and other PSM elements

As part of your PSM requirements, the MOC is interconnected with and dependent upon other elements of PSM. It is important that your MOC and other PSM elements (i.e. asset lifecycle and maintenance management, emergency response and preparedness, process-job-environment risk analyses, employee training management, and document control) work together and that any necessary changes are made to your process safety information (PSI) and made readily available to your staff. PSI affected by your MOC can include Piping and Instrumentation Diagrams, procedures, work orders, change requests, etc. Poor implementation of MOC process may affect mechanical integrity and lead to anything from unplanned downtime to potentially worst case scenarios. This is just one example of many on how mismanaging your MOC process can have significant impact on your operations.

An integrated MOC enterprise solution unifies the various essential MOC steps on a single global platform with closed-loop processes. As a unified system, it can provide consoles for various risk management processes: MOCs; Risk Assessments; Incident Management; Audits; Corrective Actions, and the like; helping to raise visibility, manage the potential risk, and drive process execution by involving the right people at the right time for all sources of risk.

From data gathering to providing information for decision-making

Initially, when companies implement an MOC process, they typically have large amounts of MOC data, but lack the ability to turn that data into useable information. However, if managed correctly, the MOC data can help organizations significantly to achieve and sustain operational excellence. Some ways to get meaningful information from your MOC process data include:

- Process Data Capture – MOCs are sometimes documented after-the-fact. That is, after the process has been completed. This results in “flat” data that only includes the facts and outcomes of the MOC process. For meaningful insights into PSM behaviors and processes, the full life cycle of the MOC process should be followed in the system as the activities occur. This provides a clear picture of how well (or how poorly) the process is being performed, and people are getting engaged.
- Visibility – Lack of real decision-support information; risk is often assessed within the plants, without the information being made available to the management/ executive level. Reports and dashboards should be provided to the appropriate stakeholders, whose information needs will vary and change over time.
- Consistency in Risk Assessments – Different areas and operations in the plant require the appropriate application of techniques and should involve the right team members and expertise to identify hazards and failures for accuracy of information. A high degree of consistency in the risk assessments is also crucial to prevent duplication of mitigations and controls. Yet these are commonly experienced problems in plants.
- Knowledge-sharing / Learning Opportunities – Incidents and near misses and the resulting hazards identification are not always shared or reused in existing or new facilities. When key individuals transfer posts or change roles the company’s risk management intellectual property is essentially lost, hence, it needs to be captured for future reference in a way that allows easy access to this information to future MOC stakeholders.
- Eliminating Redundancy – Multiple risk management processes, such as occupational health and safety,

process safety, and environmental systems, lead to additional work and the potential for unnoticed and overlapping risks. Processes should be streamlined and integrated onto a single enterprise platform for maximum efficiency.

The Sphera **Management of Change (MOC) Solution** enables companies to control the impact of change on their operations while protecting overall productivity through a unique set of software, content and community of experts. Our community of experts includes industry professionals with over 30 years of expertise and hundreds of customers from asset-intensive companies. For more information on the Sphera MOC solution visit www.Spherasolutions.com.

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Appendix C: Glossary

CCPS	Center for Chemical Process Safety
CSB	The U.S. Chemical Safety and Hazard Investigation Board (CSB)
EO	Executive Order
HCA	Hazard Control Analysis
MOC	Management of Change
MOOC	Management of Organizational Change
P&ID	Piping and Instrumentation Diagram/Drawing
PHA	Process Hazard Analysis
PSI	Process Safety Information
PSM	Process Safety Management
PSSR	Pre-Start-Up Safety Review
RFI	Request for Information
RIK	Replacement In Kind
SME	Subject Matter Expert

About Sphera

Sphera is the largest, global provider of software and information services in the operational risk, environmental performance and product stewardship markets. For more than 30 years, we have helped over 2,500 customers and 1 million individual users in 70 countries optimize workflows and navigate the complex and dynamic global regulatory structure.



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