

Howden Risk engineering

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HOWDEN

The edition focuses on Management of Change (MoC)



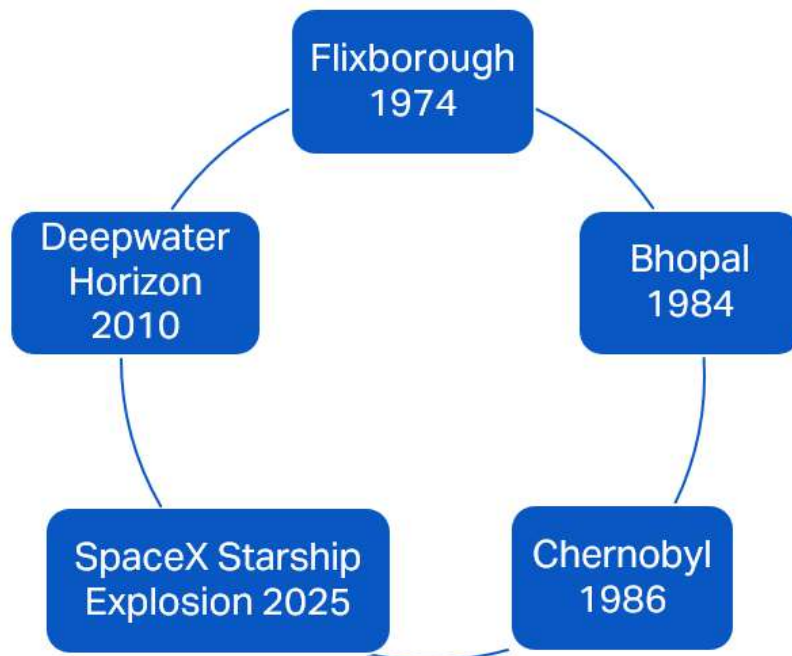
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Background

What's common between the below major industrial disasters?



It was the failure of effectively managing changes- one of the key pillars of Process Safety Management.

As Trevor Kletz said in his book- Learning from Disasters- "People have memory, organizations have no memory".

Industrial accidents have a long history of leaving behind devastating consequences, both human and economic, more than just damaged infrastructure. Despite advancements in technology, automation, and regulatory oversight, large scale disasters still occur, often with catastrophic results. These incidents don't just cause equipment damage or production delays, they cost lives, disrupt communities, and erode trust.

One of the common root causes of these incidents is the failure of "Managing Changes across the organization".

In this newsletter, I have tried to cover "Management of Change" from an industrial facility aspect however most of the principle applies to each corporate and can be tweaked depending on the organizations' s services.



Introduction

Management of Change (MoC) is a structured and comprehensive process designed to manage modifications throughout the entire lifecycle of a facility—from the initial stages of engineering design, through construction and operation, and ultimately to decommissioning. This process ensures that all changes, whether temporary or permanent, are systematically evaluated and controlled to maintain safety, reliability, and regulatory compliance.

MoC applies to a wide range of modifications, including changes to physical assets such as equipment and plant infrastructure, alterations in materials used, updates to process control systems, and shifts in operating conditions. It also encompasses changes in organizational elements such as staffing—particularly critical roles like operators—along with revisions to operational standards, procedures, and legal or regulatory requirements that govern the facility.

The core objective of the MoC process is to prevent the introduction of new hazards and to avoid unintentionally increasing the risks associated with existing hazards. By implementing a formal review and approval mechanism, MoC helps ensure that every proposed change is thoroughly assessed for its potential impact on health, safety, environment, and operational integrity before it is executed.

What is change?

Change refers to modifications, alterations or adjustments that occur across different facets. The MoC procedure could be applicable to mainly 4 types of changes-

- a. **Plant:** addition or deletion of equipment
- b. **Process:** changing parameters within the plant
- c. **People:** changes within the organization
- d. **Procedure:** changes to operating or emergency procedure

There are various types of changes like Temporary changes, Permanent changes, Process changes, Hardware changes, Process control changes, Process condition changes, Procedural changes, Organization changes and Practice changes.

Temporary events such as the examples below require MOC:

- **Transfer of equipment to a temporary location due to infrastructure expansion**
- **Temporary procedure changes due to the installation of new equipment features**

Even though these changes will not become a part of your standardized processes, it is still important to be prepared for any negative impact they may have on the organization, its facilities, and its people.

It is also critical for organizations to close out any MOC documentation of a temporary change or to update the program if the temporary change becomes permanent.

The type of change that may be **excluded** from the site MoC process are:

1. **Replacement in Kind:**

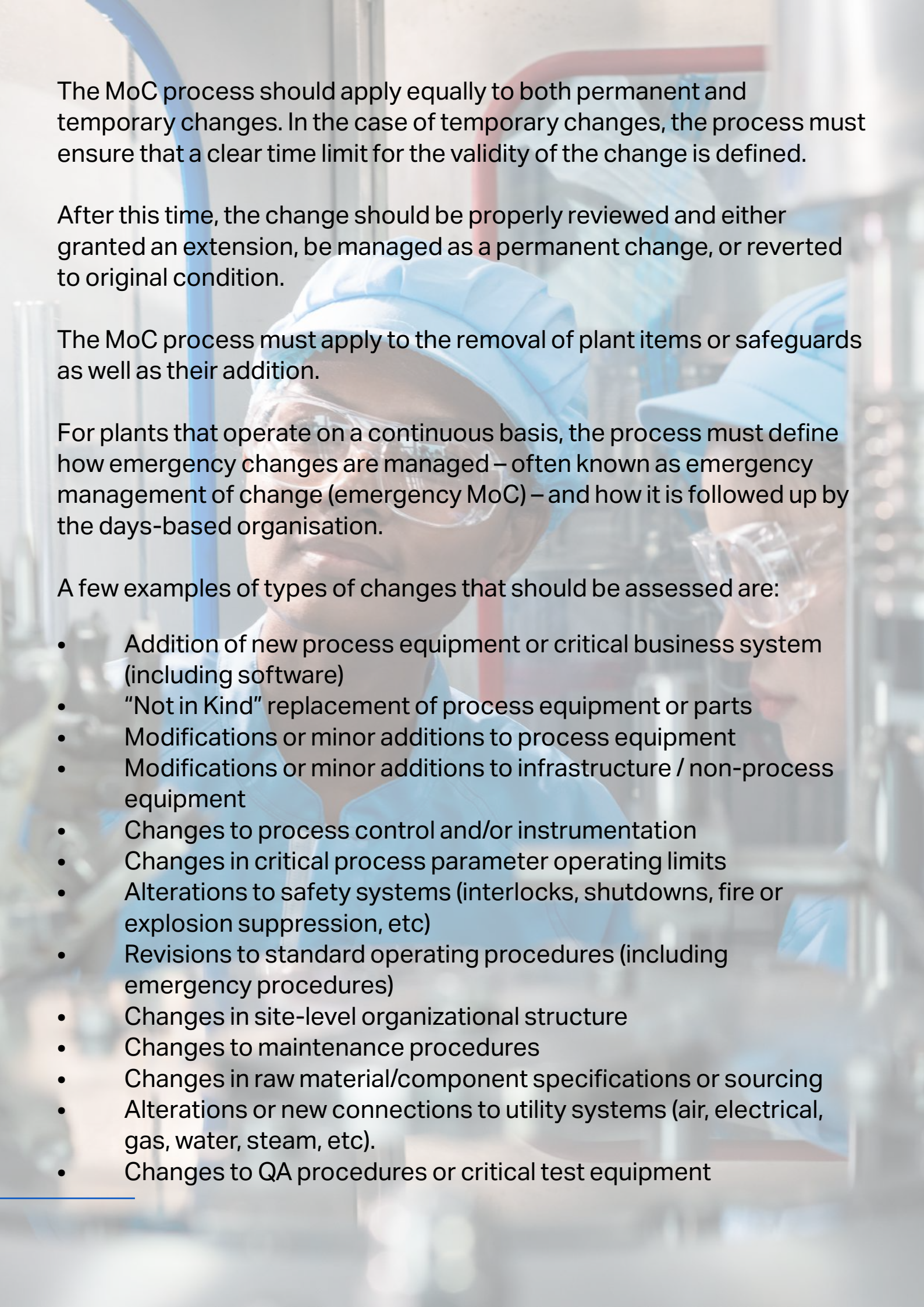
When an item is replaced with an identical item, usually in the course of routine maintenance, it is a direct like for like replacement

2. **Those covered by Alternative Processes**

Where other specific and documented processes exist on site to manage specific changes, the MoC process will not be applicable.

Common examples of these are:

- Larger projects or modifications, usually where designed and executed by a projects function.
 - Certain (defined) changes in feedstock to the site or defined changes to operating modes.
 - Instrument or control system changes within defined parameters.
 - Changes or updates to operating procedures.
 - Organisational changes.
-



The MoC process should apply equally to both permanent and temporary changes. In the case of temporary changes, the process must ensure that a clear time limit for the validity of the change is defined.

After this time, the change should be properly reviewed and either granted an extension, be managed as a permanent change, or reverted to original condition.

The MoC process must apply to the removal of plant items or safeguards as well as their addition.

For plants that operate on a continuous basis, the process must define how emergency changes are managed – often known as emergency management of change (emergency MoC) – and how it is followed up by the days-based organisation.

A few examples of types of changes that should be assessed are:

- Addition of new process equipment or critical business system (including software)
- “Not in Kind” replacement of process equipment or parts
- Modifications or minor additions to process equipment
- Modifications or minor additions to infrastructure / non-process equipment
- Changes to process control and/or instrumentation
- Changes in critical process parameter operating limits
- Alterations to safety systems (interlocks, shutdowns, fire or explosion suppression, etc)
- Revisions to standard operating procedures (including emergency procedures)
- Changes in site-level organizational structure
- Changes to maintenance procedures
- Changes in raw material/component specifications or sourcing
- Alterations or new connections to utility systems (air, electrical, gas, water, steam, etc).
- Changes to QA procedures or critical test equipment

Roles and Responsibilities

The site should assign personnel with the proper skills and experience to manage and facilitate the MoC process. Key roles and responsibilities are as follows:

Employees are responsible for:

- Participating in the MoC process as subject matter experts as applicable
- Reporting all inaccurate information

Supervisors are responsible for:

- Identifying and evaluating requirements for change
- Ensuring hazards and risks associated with MoC are adequately addressed in the MoC process

Leaders are responsible for:

- Resourcing the MoC process of the organization
- Taking corrective actions where MoC is deficient

Change is often required to meet various operating circumstances, achieve required improvements or respond to emergency conditions. Careful consideration must be given to the safety, cost and environmental implications that result from any change. Without proper review, a change may result in unsafe conditions, process hazards, or operating problems. Specific organization should have a well-defined document for managing changes.

Each site will have its own organizational structure and may have different titles for the key job roles within the organization. However, the following key roles in the MoC process must be fulfilled in some way on each site.

Role

Responsibility

The process requires a person who takes overall ownership for driving the change through the MoC process. This person will also typically:

- Produce a written proposal for initial approval.
- Ensure that the key people are involved at the right times.
- Ensure that the process has been followed

MoC

The owner may not be a fixed role within the organisation – it often varies depending on the nature of the change. Although the most common owners will probably be members of the operations staff, it may be from a discipline appropriate to the type of change being proposed.

For example, a piping change would typically be owned by mechanical engineers, a process or relief change by process engineers, and so on.

Discipline Engineers

Depending on the nature of the change, a number of different disciplines may input into the MoC process. As highlighted earlier, one of the discipline engineers may also be the owner of that change.

Discipline engineers may need their input to the MoC process to be checked or verified by the corresponding technical authorities on site, depending on their level of seniority or experience.

Role

Responsibility

Risk Assessment Authority

As described later, an MoC process requires risk assessment processes appropriate to the size and nature of the change to be selected and executed.

Sites require a person or person(s) who are capable of taking this view and supporting the execution of these processes to be appointed. It is considered good practice that the risk assessment authority is independent of the change being made.

MoC Approver

There are a number of approval steps in the MoC process. The precise number of signoff steps will be site specific and may involve budget-related approvals in addition to safety and hazard evaluation type steps.

The MoC approver on site must be an appropriate, competent (often senior) person relevant to part of the site which the change affects. MoC approvers are often senior members of the operations staff.



The document details requirements for managing risks arising from all categories of changes.

The MoC process should consider the following:

- Entire documentation identifying change description, reason and technical basis for change
- All associated engineering drawings, procedures, or other documents
- Hazard identification and risk assessment related to the change and their impact (i.e.: Safety, Cost, Project Schedule... etc.)
- Mitigation measures for risk reduction/ elimination
- Approval criteria and authority of changes
- Compliance with legislation and approved standards
- Applying and acquiring of appropriate permits
- Identify and appoint responsible person leading and managing the MoC process as follows:
 - ◇ All types of changes should be documented, tracked, performance managed and verified for effectiveness
 - ◇ Define delegated authorities for decision making
 - ◇ Develop and agreed list of delegated authorities for each identified responsible person/position
 - ◇ Identify designated competent personnel (Review panel) responsible for reviewing the scope of change, classification, and risk assessment and mitigation measures





MoC process

The MoC procedure on each operating site will be different. The local procedure may combine or further subdivide the sections below, or call the steps by different names. However, it is expected that each of the key elements below would be included in some way in the local process.

The site may mandate the use of routine or scheduled meetings to manage the key aspects of the site MoC process. This is sometimes done both for efficiency and to promote direct discussion between the key participants. If this is not a part of the site process, the risk assessment authority needs to assess which changes merit the need for face to face discussions and meetings for key stages.

MoC Initiation

When an applicable change is required on a site, a written summary of the proposed change should be produced for review and initial approval and authorisation by one of the MoC approvers on site.

The initial changes are discussed within a Cross Functional Team to evaluate the type of changes.

MoC initial approval and registration

Once approved, this initiation step requires-

- Assignment of an owner/coordinator for the MoC (the MoC owner)
- Registration of the change within the site MoC system

The purpose of this step is to ensure that a suitable design is made by a competent person. The initial design then forms the basis of the risk assessment processes that are performed.

The MoC owner should ensure that a suitable design has been made, bearing in mind the following practices:

- Checking that the design satisfies the fundamental requirements of the MoC.
- Consulting with all appropriate disciplines.
- Documentation of all calculations, referring to appropriate standards.
- Following the site internal technical processes for approval of the design.



Risk Assessment Process Selection and Execution

The risk assessment element is central to the whole MoC process. It ensures that all of the consequences of the change are fully understood, with all risks appropriately managed.

The first step is to determine which risk assessment processes will be used for the specific change under consideration. It is normal that different levels or types of risk assessment processes can be used within the MoC procedure, appropriate to the size and / or significance of the change being made.

Good practice is that the selection of risk assessment processes must be done by the identified risk assessment authority or a cross functional subject matter experts. Sometimes a structured approach, such as a complexity test, is used to assist the selection of the appropriate risk assessment process. The site should have at least two levels of process available-

a. Checklist Method

These can be either paper or software based. To use this methodology, sites should have a suite of checklists available to be used for different types of change. It is important that the risk assessment authority or CFT should approve which checklists are applicable to the change in question.



Actions from the checklists must be recorded in the MoC documentation system. Each checklist must be formally signed/authorised when it is completed.

b. Full hazard Analysis

It is expected that for larger and more complex changes a more in depth, rigorous method of hazard analysis will be performed. In many cases, the HazOp process will be the most appropriate one to use. This technique is well known within industry. Some basic points which needs to be observed are-

1. HazOp is based on a fixed/frozen design
2. HazOp team leader is trained and competent to lead a HazOp study
3. The HazOp team leader is independent of the change owner or site
4. Appropriate disciplines are included in the HazOp team and that they have appropriate knowledge of the plant and the change.
5. Team has all of the appropriate documentation and enough time to perform the HazOp study

All of the changes required by the risk assessment processes must be incorporated into a new fixed design and the appropriate MoC documents updated. This may require the risk assessment processes to be repeated.

Where the nature of the proposed change is large enough that more fundamental risk assessment processes are appropriate, the risk assessment authority needs to consider if a major project type process is more appropriate to manage the change instead of the MoC process.

Pre Commissioning

(Pre- Startup Safety Review- PSSR)

Prior to the commissioning of the change, a number of check steps must be performed. Together these are often called a PSSR or pre startup safety review. The PSSR could consist of a number of different elements depending on the nature and complexity of the change.

As a minimum, it is expected that the PSSR will cover:

- Field Verification of installation against design (e.g. punchlisting).
- Completion or revision of operating procedures
- Training of relevant personnel
- Notification of relevant stakeholders

Final Authorization and Commissioning

This step confirms that all prior phases have been properly executed. The designated MoC approver reviews the documentation and process compliance before authorizing the change for commissioning.

Good practice for the commissioning step will involve a summary version of the MoC documentation being taken to the local operations personnel. The role of the local operations personnel is to verify that the change has been fully authorised and check that any training and updates to procedures still appear appropriate to the final change being implemented. The change can then be commissioned.

Once commissioned, the MoC documentation should be signed as such to confirm its status. This often constitutes a formal handover of the changes to the operations team.



Close Out

The close-out part of the process involves ensuring that all of the follow-up actions after commissioning of the change are completed. This should include (but not be limited to):

- Update of the drawings, data sheets, and other key documents to "as built" status.
- Identifying and stocking new spare parts
- Completing and documenting performance testing
- Registering a new equipment in maintenance and inspection systems.
- Finalizing and communicating any procedural changes
- Resolving outstanding actions from risk assessment or PSSR

The close-out processes required are often themselves identified on a checklist of potential actions and steps. They will be different depending on the nature of the change.

For temporary changes (handled under a temporary MoC), one of the key and final actions is the return of the plant to the original design. The MoC Owner should retain formal ownership of the change, and the MoC documentation should remain at "open" status within the tracking system until all of the close-out processes are completed.

Pre-Requisites Of MoC Process

System Of Documentation

An appropriate system is required to register, track, and manage changes within the site. The system can take a number of forms but it is often integrated with the site records process and maintenance management system.

The system needs to be able to:

- Assign each change a unique number.
- Provide overview information – type of change, reason for the change, description.
- Document the key individuals involved in the MoC (owner, discipline engineers, authoriser) for this change.
- Store the key documents generated during the process (design, hazard analysis, and so on).
- Track the status of all actions associated with the change.
- Track key MoC dates (required by date if urgent, expiry date if temporary, and so on).
- Track the overall status and approvals of the change (often using a master control sheet).

The system must also be capable of producing key performance indicators (KPIs) which describe its operation and performance, as described in section 5 of this document.



System Of Training

It is important that all of the key personnel involved in the operation of the site MoC process are trained in the reasoning behind the procedure, the way it works, and their specific responsibilities in its operation.

Those to be trained should include:

- MoC owners.
- All discipline engineers who might contribute to MoC.
- Risk assessment authorities.
- MoC approvers.
- Operations and maintenance supervisors and safe work permit issuers (to assist recognition of when the MoC process should be followed).

The site may also choose for a wider group within the organisation to have an outline understanding of the MoC process and procedure in addition to detailed training for the roles listed above. This is so the broader organisation can recognise when a change requiring the application of the MoC process occurs.

The training system should train people when they move into the key roles for the first time, and also deliver refresher training to those individuals with an appropriate frequency.

If the site has a role within the organisation which takes overall responsibility for MoC, this individual will often perform the training for the other key roles in the MoC process.

Stewardship Of The MoC Process

The performance of the MoC process should be regularly monitored and assessed using both a routine review of KPIs and also a periodic audit. These steps help assure the site management team that the system is actually being used in the way it is designed and intended.

An operating site would also typically have a specific individual or job position that has ownership for the MoC process and takes a lead role in operating and monitoring the system.

Key Performance Indicators

Each site should routinely produce KPIs to monitor the performance and health of its MoC system. The KPIs should be produced monthly and be reviewed at an appropriate site forum, such as the site process safety management committee.

Routine KPIs would typically include:

- Total number of open MoCs, with some details showing when they were originally raised.
- The number of MoCs raised in the review period.
- The number of emergency MoCs raised in the review period.
- The number of temporary MoCs, and identification of any which are overdue.
- The number of completed MoCs with open and with overdue close-out actions.

The number of incidents and near miss reports attributable to failures in the MoC process. It is expected that the discovery of any change that was not handled using the MoC system would be raised as a near miss report.

In the case of overdue temporary changes and overdue actions, it is often useful to identify which MoC owners the overdue items are associated with.

Audits

Each site should audit its MoC process in some way on a periodic basis, with audits typically being completed annually. The audit should be performed by a small team knowledgeable in the application of the MoC process. Consideration should be given to including people from outside the immediate local site in the audit process. Findings from the audit should be reported to site management, possibly through forums such as the site process safety management committee.

An audit process would typically include:

- Initiation of the MoC:
 - Are changes being identified and raised at the correct times?
 - Are work orders raised and carried out for plant changes without appropriate MoC processes being used?
- MoC process:
 - Review a selection of MoC dossiers – are the key steps being followed?
 - Are the approvals being made at the right stages, and before commissioning?
 - Are the MoCs being closed out, with actions completed appropriately?
- Risk assessment processes:
 - Are the appropriate risk assessment processes being selected?
 - Are the processes being followed properly/thoroughly?
- Personnel related:
 - Do the key personnel understand the process?
 - Do they understand their roles and responsibilities?
 - Have they been trained?

In addition to these two stewardship steps, as is the case for most key site processes, the understanding and support of senior site leadership is critical to its success and effectiveness. Management emphasis that MoC must always be applied in all appropriate circumstances, whatever the circumstances on the day, is key.

References

The following references have been used when writing this document, and may provide further guidance to the reader:

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