



Temporary Management of Change: A Problem or a Necessary Part of Managing Process Safety

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Abstract

Temporary Management of Change (MoC) projects seem to be the boogeyman of Process Safety Management (PSM). These temporary changes are frequently needed, but feared by operating company management, compliance groups, and lawyers. Some concerns regarding temporary MoCs are valid while other concerns may be based on false assumptions or incorrect interpretations of regulation. Most alarming, many of the concerns regarding temporary MoCs may lead to worse practices and the potential to introduce more risk into the business. This paper explores the reasons for this aversion to temporary MoCs and proposes a paradigm shift. Instead of considering permanence as the norm, consider that everything is actually temporary. The key is designing, operating, and maintaining for the appropriate window of time. The change will only be approved if the risk falls within accepted company protocol for the required duration of the change. The author will define five categories of temporary MoCs for the purpose of clarifying that one-size-fits-all duration limits and protocols are not appropriate. The author will address three myths regarding practices for managing temporary MoCs that may lead to unintended negative consequences. And finally, the author will propose preferred practices that avoid these unintended outcomes leading to more efficient work processes and safer operations. The need for temporary MoCs and the risks of mismanagement of those temporary MoCs must be well understood by both regulatory agencies and operating companies. Policies and procedures must drive practices that assure safe operation for any time horizon given real world impacts and constraints.

1 Introduction

Since the inception of process safety management (PSM) regulation [1], management of change (MoC) has been recognized as one of the most crucial elements of the regulation. Management of temporary changes is often highlighted as a critical and potentially more problematic type of change to be managed.

The incident at Flixborough, 1974 [2][3][4], is frequently cited as an early example of not only inappropriate management of change but also inappropriate management of temporary change. This event involved a temporary bypass that had been installed two months before the incident in order to maintain production while a failed cyclohexane oxidation reactor was repaired. A temporary piping modification – including the pipe, bellows, and pipe support - was designed,

installed, and operated without appropriate mechanical review by qualified personnel. The temporary bypass piping failed during a plant start-up that followed unrelated repairs. A vapor cloud explosion followed the release of a large amount of cyclohexane. The explosion killed 28 employees, injured 89 employees and members of the surrounding community, destroyed the plant, and damaged many nearby homes and businesses.

In the intervening years, and especially within the last 25 years since the enactment of the Occupational Safety and Health Administration (OSHA) PSM regulation [1] and similar regulation in other jurisdictions, better PSM practices have become more widely understood and implementation has improved. Most operating companies now routinely apply management of change practices that are intended to address the causes that contributed to the Flixborough incident. Management of Change requirements are widely understood to include appropriate technical and process safety review of the design, drawing and other process safety information (PSI) updates, procedure updates, completion of necessary training and awareness communications, and pre-start-up review to name a few.

Those better practices include demanding equivalent review and approval requirements for all changes – including temporary changes. Where the change is temporary, certain other requirements are stipulated and must be addressed. These additional requirements relate to specifying a duration limit for the temporary change. The temporary change may also include additional safeguards and enhanced monitoring, inspection, and/or maintenance procedures that are specifically applicable for the duration of the temporary change.

This paper examines several myths related to management of temporary changes. While having a limit on the duration for a temporary change is appropriately understood to be an essential requirement for managing any temporary change, this paper addresses several pitfalls where specific interpretations of and practices related to that requirement may actually introduce unintended consequences and risk into the operation. Likewise, the allowance for conversion of temporary MoCs to permanent will be addressed. This practice is often allowed per procedure but is also not advisable or recommended. These practices coupled together can and will often lead to unintended negative consequences. The author offers a preferred approach for defining requirements specifically related to temporary MoCs and outlines a work flow process that places design requirements for the change – including duration and risk assessment - at the front end of the design and approval process.

2 Background

Below is a brief recap of a number of background assumptions and some history regarding management of change and management of temporary changes.

2.1 Knowns

- There is a known history of major, minor, and near-miss incidents and failures associated with improper management of change.
- Temporary changes have been part of that failure history.
 - As per OSHA Appendix C, “Temporary changes have caused a number of catastrophes over the years” [5].

- Temporary changes often do not meet company specifications, standards, and/or normal operating limits and, therefore, are expected to have shorter service lives than permanent changes and may also require more rigorous monitoring, inspection, and/or maintenance and may include additional safeguards or layers of protection.

Two examples of familiar temporary changes are shown below:



Figure 1. Blue tarps on roofs after hurricane [6].



Figure 2. Pipe repair using pipe clamps [7].

- Due to the above as well as regulatory requirements, approval of temporary MoCs must include a duration limit. Without a duration limit, the operator may lose track of the temporary change and it may effectively become permanent even if not originally intended to be permanent [5].

2.2 Debunked Untruths Some early presumptions are now widely understood to *not* be true.

- It is not true that temporary changes are of such a short duration that review requirements are lesser than standard changes.

- Review requirements for temporary and permanent MoCs are the same. Procedures must stipulate equivalent review requirements.
 - OSHA 1910.119 (I) provides no allowance for lesser or weaker review requirements for temporary MoCs. No distinctions between temporary and permanent MoCs are mentioned in the PSM regulation [1].
 - As per OSHA Appendix C, “Temporary changes are subject to the management of change provisions [5].”
- It is not true that Process Safety Information updates are waived or are inapplicable for temporary changes [1].
 - Current Process Safety Information (PSI) must be available to personnel involved in the operation regardless of the nature or duration of the change.
 - As per OSHA Appendix C, “Copies of process changes need to be kept in an accessible location to ensure that design changes are available to operating personnel as well as to PHA team members when a PHA is being done or one is being updated [5].”
 - How a company addresses this requirement will vary based on individual company protocols and document management procedures.
 - The regulation does not stipulate the format, such as electronic updates versus hand mark-ups.
 - The regulation does not stipulate the timing for formal updates. Updates for larger studies may require special protocol. Depending on type of study and length of temporary MoC, certain updates may be deferred. Company procedures should ensure that any unincorporated changes are communicated and that a reference to the MoC is made available.

2.3 Myths This paper will address the following myths and propose alternative recommendations.

- Myth 1: Most temporary changes are terminated by returning the system to the prior condition, also known as reversing the change.
- Myth 2: The best way to ensure limits on durations for temporary changes is to have a universal duration limit for temporary MoCs prescribed within the company Management of Change procedure.
- Myth 3: Converting a temporary MoC to a permanent MoC is an acceptable practice especially for longer duration temporary MoCs.

3 Definitions

At this time, it would be useful to ensure that we have consistent definitions for several terms. Typically, changes are defined within Management of Change procedures as: Emergency, Temporary, or Permanent.

Note: Emergency changes entail some similar concerns as temporary changes. Due to the highly reactive nature of an emergency change, special provisions are frequently considered allowable for emergency changes that are not allowable for any other type of change. These changes require special considerations and management requirements, but detailed discussion of emergency changes is not within the scope of this paper.

3.1 *Temporary*

Consider the definition of the word *temporary*:

Merriam-Webster [10] defines temporary as:
lasting for a limited time

Below are several definitions provided within reference documentation for the term *temporary change*:

Temporary Change:

- 1) “implemented for a short, predetermined, finite period [2]”
- 2) “a clear time limit for the validity of the change is defined [4]”
- 3) “planned for limited duration [8]”
- 4) “provided for a defined time period [9]”

The theme is very clear. While the term “short” is a relative term that may have varying interpretations, the reference to a finite, limited, or prescribed time period clearly conveys that the length of time that the change is acceptable to be in service must be stipulated for each temporary change.

3.2 *Permanent*

Conversely, the antonym *permanent* may be more difficult to define. These references provide the following definitions:

Permanent:

Merriam-Webster [10] definition:
continuing or enduring without fundamental or marked change

Cambridge Dictionary [11] definition:
Lasting for a long time or forever

Dictionary.com [12] definition:
existing perpetually; everlasting, especially without significant change.

The definition of *permanent* is less clear, because depending on ones’ field of view, all things could be considered to be temporary given that equipment, human life, and even our planet have a lifespan, and therefore, do not last forever or perpetually. In the case of equipment, lifespan is affected by rate of wear, availability of replacement components, potential for obsolescence of mechanical or electronic components, maintenance and operational practices, and system changes affecting design requirements.

For our purposes when considering processing equipment and plants, a good working definition of *permanent change* might be:

Permanent Change:

Expected to remain in place indefinitely. Effective lifespan will frequently be in the range of 30 to 50 years assuming normal operating and maintenance practices. Lifespan typically corresponds to life of the field or the facility.

For the purposes of this paper, *permanent change* will reflect the definition given above.

3.3 MoC

The acronym MoC, Management of Change, refers broadly to requirements associated with implementing changes. When used in the context “the MoC,” the acronym is sometimes used as a noun meaning: “the change”; “the project”; “the project ID or record from the MoC application representing a given change or project.” The acronym MoC may be used in this context in this paper.

Note: Although temporary changes may include temporary organizational changes, organizational changes are not included within the scope of this paper.

4 Regulation and Guidance**4.1 Regulatory requirements (United States)**

It would be useful at this time to ensure that we are clear on the language and intent of regulation regarding temporary management of change.

The OSHA PSM regulation, management of change section, reads as follows.

As per OSHA 1910.119 [1]:

1910.119 OSHA Process Safety Management of highly hazardous chemicals

1910.119 (l) *Management of Change*

1910.119 (l)(1) The employer shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process.

1910.119 (l)(2) *The procedures shall assure that the following considerations are addressed prior to any change: . . . (i) technical basis. . . ; (ii) impact . . . on health and safety; (iii) modifications to procedures;*

1910.119 (l)(2)(iv) *Necessary time period for the change . . .*

(v) authorization requirements . . .

1910.119 (l)(3) [Operators, maintenance personnel, and contractors] “. . . shall be informed of, and trained in, the change prior to start-up . . .”

1910.119 (l)(4) “process safety information . . . shall be updated accordingly. . .”

1910.119 (l)(5) “procedures or practices shall be updated accordingly.”

The regulation itself makes no mention of temporary versus permanent, but does indicate that the time period for which the change is approved, installed, and operated must be defined, meaning that the time period must be defined *for all changes*. Given that the period of the change is normally not explicitly defined for each permanent change, companies should formally define the term *permanent* globally within their management of change procedure. This global

definition would effectively satisfy the requirement for defining the period of the change for any and all permanent changes as these changes will generally have a consistently understood duration. Given this stipulation in the regulation, it is clear that any change classified as temporary (or emergency) must define the duration that the specific change is allowed to remain in place.

4.2 Guidance

Several clarification and guidance publications support and emphasize the requirement for defining the duration of temporary changes.

As per OSHA Appendix C:

It is important that a time limit for temporary changes be established and monitored since otherwise, without control, these changes may tend to become permanent [5].

Likewise, *CCPS Guidelines for the Management of Change for Process Safety* has similar language that refers to the requirement for specifying the allowable duration of the change.

As per *CCPS Guidelines for the Management of Change for Process Safety*:

A temporary change is approved with the stipulation that the change last no longer than a specified time and that additional safety features be implemented . . . Temporary changes need prescribed time limits, appropriate authorization, and proper documentation [2].

5 Categories of Temporary MoCs: Why are Temporary MoCs needed?

In order to understand issues, constraints, duration limits, and life cycle requirements for temporary MoCs, it is important to recognize the different reasons for these changes. Temporary MoCs will generally fall into one of six categories:

- 1) Temporary trial use of new equipment, chemicals, process parameters, process configuration, and/or procedures.
- 2) Temporary modification following a failure but preceding implementation of the permanent, long-term solution. The pending permanent change may be:
 - a. A completely new design OR
 - b. Return of the system to original specifications.
- 3) Temporary bypass or failure of safety critical devices or other components. Device or component is out-of-service due to:
 - a. Bypass, override, impairment, or removal for proactive maintenance or inspection OR
 - b. Failure or discovered defect. Device or component is not functional or not fully functional. Repairs are pending.
- 4) Temporary connections and/or temporary operations, such as in advance of shut-downs for purging or other occasional operations.
- 5) “Temporary” deferral of maintenance or inspection procedure due date including turnaround (TAR) deferrals.
- 6) “Temporary” installation intended to be followed by a future installation having more capacity or capability.

5.1 Category 1 - Temporary trial or field test

Category 1 Temporary MoCs are proactive and planned in nature. These changes would typically be considered trials or pilot studies performed in order to field-test a new idea before major or permanent modifications are made to accommodate the change. The new idea and change could be related to equipment, instrumentation, controls, chemicals, process parameters, process configuration, or procedures.

5.2 Category 2 – Temporary modification following a failure

Temporary MoCs in Category 2 are generally more reactive in nature. The Category 2 MoC is planned, reviewed, and approved but typically on a much shorter timeline in response to an unplanned failure or event. This type of MoC is always considered an interim step until a final planned modification (another MoC project) or repair may be implemented.

This two-step solution may be due to lack of availability of required materials or resources, additional time needed for design and fabrication, or a need for a larger outage in order to implement the permanent change. The long-term solution will typically require a more lengthy and deliberate project management cycle involving detailed review of the causes of the failure, full assessment of the needs, consideration of alternative solutions, detailed design of the new installation, and execution involving construction activities, installation, and start-up.

In some instances (Category 2a), the long-term solution will be a completely new design or modification addressing the cause of the failure. In other instances (Category 2b), the long-term solution may be to return the system to original specifications if the cause of the failure was related to off-specification materials, installation issues, operational or maintenance issues, or an improperly approved prior change. In those cases, other mitigations unrelated to the original design should be implemented to address the cause(s) of those introduced conditions. Although this type of “change” could represent a return to original prescribed specifications and conditions, the long-term solution to restore the original design is now effectively a change. As such, regulatory requirements as well as good project management practices dictate that all required elements of MoC be applied to this change as well. Some straightforward repairs may be excluded and not require an MoC. The permanent change, long-term solution, should be handled as a separate management of change project but should be related to the temporary MoC record addressing the same failure. Start-up of the long-term solution, a permanent modification or repair, will correspond to the closure date of the temporary modification.

Based on the author’s field experience, these types of temporary changes represent a significant percentage (estimated at over half) of the MoC projects that are managed within the core MoC application.

5.3 Category 3 – Temporary bypass or failure of safety critical devices or other components

Category 3 Temporary MoCs involve situations where safety critical devices or components are out-of-service or inoperable for any reason including 3a) being bypassed, jumpered, overridden, or removed or 3b) found failed, impaired, not functional, or not fully functional. Category 3 MoCs fit the definition of temporary management of change; however, these types of changes

may be managed under a different procedure or protocol [13] due to the nature of the condition, mitigations, and communication requirements, as well as inherent safety concerns.

Category 3a changes are planned, proactive work based on pre-written procedures, such as routine scheduled inspection, testing, and maintenance of relief devices. Category 3b changes are in response to failures and, therefore, represent reactive changes.

Although potentially handled through alternative procedures, databases, and communication tools, Type 3 Management of Change must address all items required under 1910.119 (l) OSHA PSM Management of Change. These requirements include: defining robust authorization requirements for approval of the change; completing an appropriate hazard and risk assessment to determine safety and health impacts, implementation of required mitigations and special procedures while the device is out-of-service; completion of ongoing communication and training requirements; making current PSI available; and defining a duration limit.

5.4 Category 4 – Temporary connections and/or temporary operations

Category 4 Temporary MoCs involve temporary connections to existing process equipment and/or occasional operations. These temporary changes are procedural. The procedures may involve connecting hoses, portable skids, or trucks to process equipment. These procedures may be related to equipment shut-down and isolation activities such as venting and purging of equipment. Or the procedure may represent a routine or occasional operational activity such as off-loading chemicals.

All standard management of change requirements must be addressed for the initial approval of new procedures. If the identical equipment and procedure is used in the future and the procedure addresses all management of change requirements including safety and hazard review and authorization requirements within the procedure steps, the procedure may be reused without creating another MoC record.

5.5 Category 5 – “Temporary” deferral of maintenance or inspection procedure due date including turnaround (TAR) deferrals

Category 5 temporary MoCs involve deferral of planned maintenance or inspection work beyond the scheduled due date. A temporary MoC could be used for a one-time deferral. A permanent MoC would be used for a permanent change to the maintenance or inspection interval prescribed by a particular maintenance plan. Likewise, deferral of turnarounds should be considered in the same category due to the number of planned maintenance and inspection activities that require an outage in order to be executed.

Note: Companies may chose to consider deferral of an inspection or maintenance workorder due date as a permanent change associated with the single instance of the procedure, inspection, or turnaround activity. If there is sufficient tracking of the incomplete workorder activity through the maintenance management system, that classification would be sufficient. Identifying the change as temporary would add a secondary due date flag providing additional visibility. An MoC is required whether the single instance due date deferral is considered a temporary or a permanent change.

5.6 Category 6 – “Temporary*” installation intended to be followed by a future installation having more capacity or capability

Category 6 temporary MoCs are included for the purpose of completeness. However, it is recommended that this category not be considered temporary. This category represents a two-stage modification – similar to Category 2. However, in this case, both stages of the project are fully planned and proactive. The installation of the final modification will be driven by business rather than technical needs. The interim modification will typically have less capacity or capability than the planned final modification. However, the interim modification is acceptable from a technical and safety standpoint to remain in place indefinitely. In this scenario, it is recommended that the user classify this change as a permanent MoC. Business drivers and budget availability may change. Changes of this type do not require expiration dates or flagging as overdue for closure. Occasional exception may apply.

* Note: Category 6 changes will not be discussed further, as these types of changes are recommended to be characterized as permanent.

5.7 Summary of Temporary MoC Categories

Table 1 is a summary of the temporary MoC categories discussed above. The administrative management system commonly used to manage the change category is also shown.

Table 1. Temporary MoC Category Descriptions and MoC Management System

	Temporary MoC Categories							
Category	1	2		3		4	5	6
Sub-Category		2a	2b	3a	3b			
Temporary MoC Category Description	Trials, Field Tests	Interim solution following failure		Bypass or failure of safety device or component		Temp connections / ops	PM/TAR due date deferral	Staged improvement*
Sub-Category Description		Long-term: new design	Long-term: original design	Pro-active. Procedural	Reactive: Operate without device			
Management (Mgmt) System	MoC System	MoC System	MoC System or Repair	Bypass Mgmt System; Procedures	Bypass Mgmt System	MoC System; then Procedures	MoC System	MoC System; New Projects
Note:		Interim solution is Temp MoC. Long-term solution is Perm MoC. Both MoCs relate to the failure and the other MoC.		Bypass or failure of safety critical devices could be managed in MoC system, if preferred.			Temp or Perm MoC for single instance deferral.	*Call Permanent

6 Dispelling Myths

Section 2.3 summarizes three myths that commonly exist in industry and literature regarding temporary MoCs. Many of these myths, or assumptions, do not accurately reflect the real world usage and service of temporary MoCs. More concerning, many of these assumptions have elicited internal company rules, protocols, and procedures that have a possibility and a tendency to introduce greater risk into the operation.

The author will address each myth with respect to the various categories of temporary MoCs and conclude with preferred recommended practices.

6.1 Myth 1: Most temporary changes are terminated by returning the system to the prior condition, also known as reversing the change.

6.1.1 History/Past Assumptions:

Much literature on the topic speaks to closing temporary changes by returning or reversing the change to its original or prior condition [2][4][5][13][15]. Those references imply a Category 1, 3a, or 4 change is being discussed.

As per OSHA Appendix C:

In addition, the management of change procedures are used to [ensure] that the equipment and procedures are returned to their original or designed conditions at the end of the temporary change [5].

As per Marsh:

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 [4].

6.1.2 Alternative Perspective:

Regarding Category 2 or 3b changes - temporary MoCs involving equipment or component failure, reversing the change to the original or prior condition may not be desirable because the original or prior condition may have contributed to the cause of the failure or may not be possible because the failed condition has not yet been corrected.

Consider these examples of temporary changes associated with failures (Category 2):

1. Blue tarps on roofs after a hurricane before roof repair or rebuild.
2. Pipe clamps on pipelines following a leak before permanent pipeline section repair or replacement.
3. De-rating a pipeline to address an inspection finding before permanent section repair or replacement.
4. Removing a pipeline, piece of equipment, or component from service until repair, replacement, or permanent decommissioning.

From the author's experience, Category 2 and 3b, represent the most common types of temporary MoC projects.

Table 2. Estimated Percentage of Temporary MoCs by Category

	Temporary MoC Categories						
Category	1	2		3		4	5
Sub-Category		2a	2b	3a	3b		
Category Description	Trials, Field Tests	Interim solution following failure		Bypass or failure of safety device or component		Temp connections / ops	PM/TAR due date deferral
Sub-Category Description		Long-term: new design	Long-term: original design	Pro-active. Procedural	Reactive. Operate without device		
Management (Mgmt) System	MoC System	MoC System	MoC System	Bypass Mgmt System; Procedures	Bypass Mgmt System	MoC System; then Procedures	MoC System; New Projects
% of Temp MoCs (MoC System) - Based on Count **	5 - 20%	50 - 75%				Initial approval of procedure: 5 - 20%	5 - 20%
% of Temp MoCs (Bypass Mgmt System) - Based on Count**				50 - 75%	25 - 50%		
Based on OOS Period***				10 - 50%	50 - 90%		
Note:	** Estimated based on the author's empirical experience. *** Estimated based on period or number of days out-of-service (OOS) rather than number of instances or MoC count, based on author’s empirical experience.						

As per Table 2, the majority of temporary MoCs cannot be reversed to the prior condition at an arbitrary date. Many temporary changes are interim responses to failures that require other repairs or projects to be completed before the temporary change can be removed and replaced with another change.

6.1.3 Truth 1: It is important to recognize the differing reasons for utilizing temporary MoCs. Following a failure – which is one of the primary reasons for creating a temporary MoC – the operating company must complete other work before the temporary MoC may be closed. This other work (e.g. repairs, replacements, modifications, etc.) dictates the timeline for the temporary MoC closure and may result in a new configuration.

6.2 Myth 2: *The best way to ensure limits on durations for temporary changes is to have a universal duration limit for temporary MoCs that is not “too long” prescribed within the company Management of Change procedure.*

6.2.1 History:

Operating companies have widely, if not universally, taken the approach that the best way to ensure that limits are established on temporary MoC duration is to prescribe a universal “limit” in the company Management of Change procedure or protocol. Globally established procedural limits for temporary MoC duration typically range from 90 days to one year. Some companies indicate two procedural limits: an initial limit that may be followed by extension up to a maximum limit, usually not exceeding one year. Other companies indicate a “limit” in the procedure, generally not exceeding one year, but allow for extensions beyond that limit, making the initially defined period not a true limit but a target and a checkpoint requiring re-authorization. Some companies establish an ultimate limit by using “shall” or “must” statements that preclude approving extensions. Other companies may not prescribe fixed duration limits, but due to discomfort with longer duration temporary MoCs, simply do not allow or approve lengthy temporary MoCs.

Presumably, this approach is seen as the best way to address the following realities. Temporary MoCs:

- ⇒ involve a change that is approved for only a limited duration
- ⇒ are required by regulation or recommended by guidance literature to have a stipulated duration limit and
- ⇒ are often seen as having a risk or tendency to become effectively permanent if they linger or remain in place “too long.”

The consensus solution seems to be: apply a universal limit for temporary MoCs and make it not “too long.” Interpretations of not “too long” vary but typically land on one year or less. Some companies may interpret the regulation as requiring a single, fixed, defined limit for all temporary MoCs.

6.2.2 Alternative Perspective:

This approach of indicating a single, universal duration limit for all temporary MoCs – while well-intended - is inherently flawed and inherently unsafe. This approach will inevitably lead to unintended consequences that could introduce more risk into the operation. Here’s why, . . .

1) First of all, . . .

it is important to recognize the differing reasons for utilizing temporary MoCs as the differing categories of temporary MoCs will have very different drivers for both initiating the temporary MoC and very different time horizons and dependencies for closure of the temporary MoC.

Category 1 changes, trials and science projects, are entirely proactive. Although each temporary change must have a specifically defined period, this category of temporary change could have a wide range of desired and acceptable durations. The change must be designed to safely meet the intended and necessary life of that change. Thus, globally prescribed limits or even targets are not necessary.

The driver for the duration should be defined within the project scope. Similarly to project cost and schedule estimating, duration estimates should incorporate contingency planning so that the design and assessment properly consider the realistic worst case rather than the best case for how long the change could remain in place. The design should be robust so that the risk falls within the company prescribed risk management boundaries for the realistic duration of the temporary change (See Figure 3). The change may be able to be designed so that no incremental risk is incurred during the term of the temporary change as per the process hazard assessment.

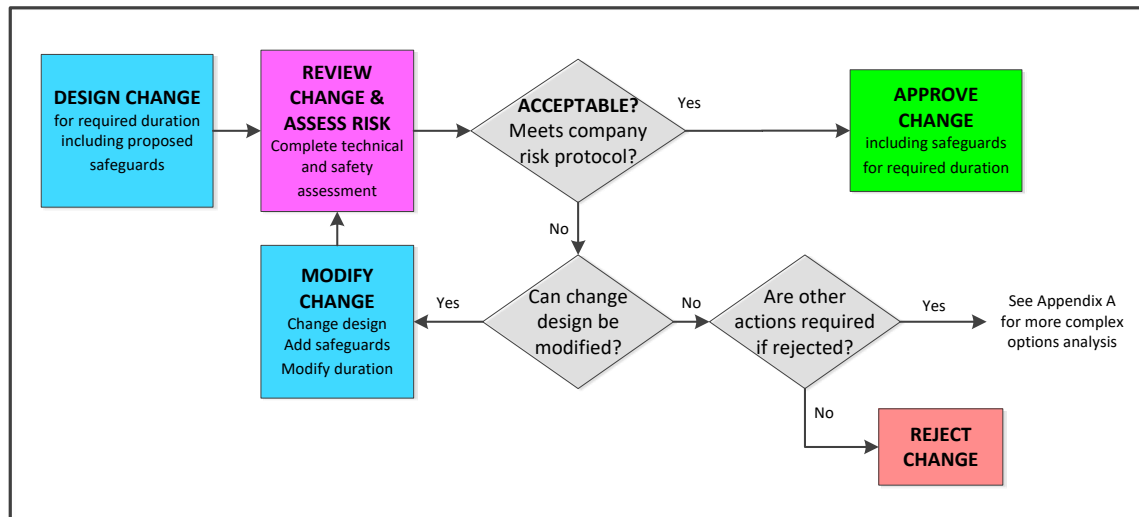


Figure 3. Simplified Work Flow Process: Temporary MoC Review and Approval

As with all temporary MoCs, the expiration date prescribed within the specific MoC should be queryable and monitored so that as the deadline approaches, planning will accommodate closure, which means reversal in this case, by the due date. The contingency built-in up front will aid in on-time closure and make it more likely that the original design and initial technical, safety, and operational reviews consider the full-term of the change.

Category 2 temporary changes are interim solutions in response to failures or unplanned events. The duration limits for Category 2 changes are entirely driven by the timeline and critical path for the implementation of the longer-term solution. This long-term solution is directly related to the failure that drove the interim solution. Duration needs for Category 2 MoCs will also be highly variable. A single prescribed limit is not appropriate for this type of MoC.

As with Category 1 MoCs, when defining duration for the Category 2 MoC, it is important to consider the worst-case timeline that incorporates contingency for the long-term project schedule. The long-term solution and all critical path items associated with the long-term solution may not be fully defined at the time that the temporary change will be initially designed and approved. However, some critical path drivers may be known, such as timing for procuring material and future planned shut-down opportunities if a larger unit or plant shut-down is required.

In the case of Category 3a changes - proactive procedures for performing inspection, testing, and maintenance of safety critical devices, these procedures should have very limited duration allowances, typically in the range of 8 to 12 hours (single shift) or less. However, even these procedures should have individually prescribed duration limits based on the specific application and requirements of that procedure. (Refer to Figure 4, Example 1 for an example of a Category 3a change and associated risk assessment.)

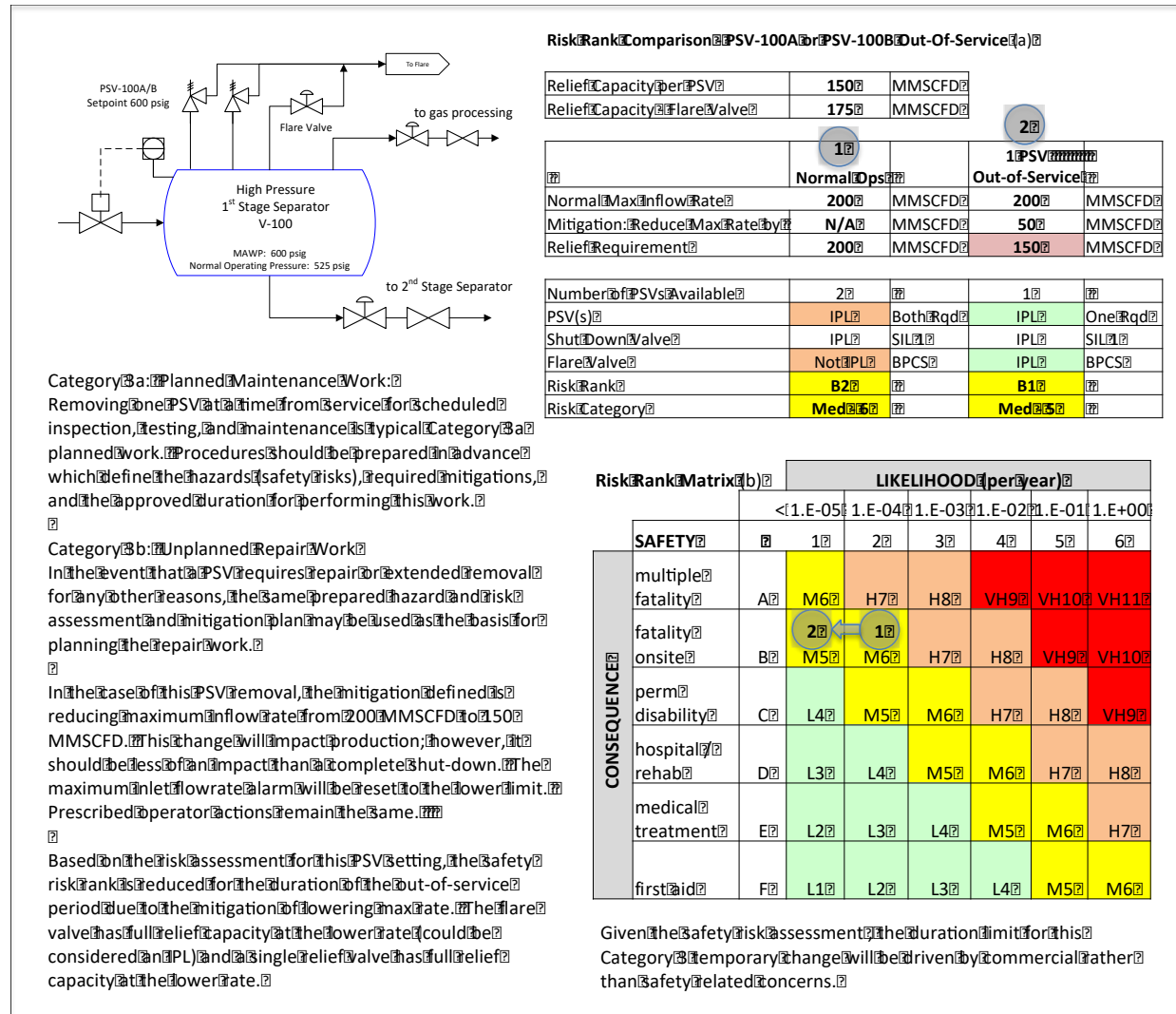


Figure 4. Example 1: Category 3 Temporary MoC Separator PSV Out-Of-Service. Risk Comparison is shown as (a) with data and independent protection layers (IPL)s. Risk Rank Matrix is shown as (b).

Category 3b situations - out-of-service or failed safety critical devices or other components - will have initial authorization requirements. Then, these instances will typically have reauthorization and communication requirements prescribed on daily, weekly, and monthly intervals, which are similar to duration limits. Re-authorization requirements typically escalate to higher levels of management as the out-of-service duration extends. However, as with all temporary MoCs, authorization or reauthorization of the 3b temporary MoC must consider all elements of the change including current condition, safeguards, mitigations, and risk. Example 1 in Figure 4 also discusses the PSV removal in the context of a Category 3b reactive change.

In certain cases, appropriately addressing the cause of the Category 3b failure could require extended efforts. If modifications are required, a separate MoC is typically written for the long-term solution. In these cases, the resolution timing for the Category 3b failure would resemble the timelines associated with Category 2 temporary changes.

Note: Category 3 MoCs are sometimes managed through alternative protocols and procedures. If a modification is required to address the cause of a Category 3b failure, the temporary change and the long-term change may now be managed in two systems.

Regardless of the system in which the change is managed and the semantics of duration limits versus reauthorization or extension, the review of the change for authorization, re-authorization or extension must receive detailed technical and safety review, assurance of adequate safeguards and procedures, evaluation of risk, and consideration of alternative options including process shut-down, as needed. Shut-down considerations must weigh risks associated with shut-down and start-up activities against the risk of continued operation in the current state. The realistic timing for the resolution should be understood and be built into subsequent reauthorization or extension requests. Refer to Appendix A for a more detailed version of Figure 3 work flow where more complex options analysis is required. Although it is desirable for Category 3 temporary changes to have very short durations, a failed device or device prone to failure cannot be returned to service.

Category 4 changes – temporary connections and/or temporary operations - will have duration limits defined by the procedural activity to which these changes relate. These limits may be in the range of one shift to 48 hours. This timing will be specifically dependent on and defined by the activity to be completed as well as the risk assessment. These activities might be handled within the MoC system for only the first instance of approving and using a new procedure.

The Table 3 summarizes the typical range of temporary MoC duration by category of temporary MoC. Defining and understanding the change category or type should aid in understanding the duration needs for a given change, which in turn leads to appropriate design and more robust approval protocol.

Table 3. Temporary MoC Category Descriptions and Typical Duration Range

	Temporary MoC Categories						
Category	1	2		3		4	5
Sub-Category		2a	2b	3a	3b		
Category Description	Trials, Field Tests	Interim solution following failure		Bypass or failure of safety device or component		Temp connections / ops	PM/TAR due date deferral
Sub-Category Description		Long-term: new design	Long-term: original design	Pro-active: Procedure	Reactive: Operate without device		
Typical Duration Range	Variable (Months to Several Years)	Variable (Months to Several Years)	Variable (Months to Several Years)	8 to 12 hours (single shift)	Days to Months (or longer); intervals prescribed to reauthorize	Hours to Days	Variable (PM: Days to Months; Defer TAR: 1 -2 years)
Duration Tied to	Temp MoC design intent	Perm MoC timeline	Perm MoC timeline	Procedure guidance	Repair or Perm MoC timing (like Cat 2 Temp MoC)	Procedure guidance	Various: outages, resources
Note:	Process hazard risk assessment is built into all temporary MoC project or procedure design including prescribing safeguards and mitigations required to bring risk to an acceptable level for the required project duration. (See Figure 3 and Appendix A.)						

2) Secondly, . . .

it is important to recognize that the language in these global procedures – specifically the universal duration limits - does not represent truth or reality. Some temporary MoCs will inevitably need to go longer than one year . . . and some should.

By recognizing the driver(s) for the duration and defining a plausible timeframe for the temporary change, the technical, safety, environmental, operational, and process safety reviewers will assess the change with a more critical and realistic eye for actual design needs for the project. Placing arbitrary or unrealistic limits on the duration of the temporary MoC will improperly communicate the true design needs to the technical and operational professionals evaluating the change. If the change needs to remain in place over four years to reach the next plant outage opportunity, the design, operational, and maintenance requirements must reflect the needs to safely operate for that period of time. If the change is unacceptable for that duration, a design change or another alternative option must be considered. (Refer to Figure 3 and Appendix A.)

By placing arbitrary limits taken from global standards on the maximum duration for temporary MoCs and then allowing for extension, the true design requirements of the change are not accurately reflected when the design is reviewed and approved. Documentation and approvals must reflect the true anticipated life. If the documented duration of the change does not reflect the intent or need, the MoC could be subject to audit findings.

Even with specificity and contingency built-in, changes to the long-term project scope or definition may affect the implementation timeline and, therefore, require review and re-evaluation of the temporary MoC to consider extension of that change. However, the number and length of extensions can and should be minimized by avoiding use of arbitrary, globally applied duration limits for temporary changes.

Of note, when extension requests are reviewed and approved, the phenomenon of “normalization of deviation” can lead to weaker scrutiny when perpetuating a temporary change that is already in place. Therefore, limiting the number of extensions is desirable.

It is also important to keep in mind that defining realistic and reasonable schedules rather than forced, aspirational but unrealistic schedules will lead to more robust ultimate solutions. Recall the good-fast-cheap triangle [14] and the truth that it teaches us regarding project management.

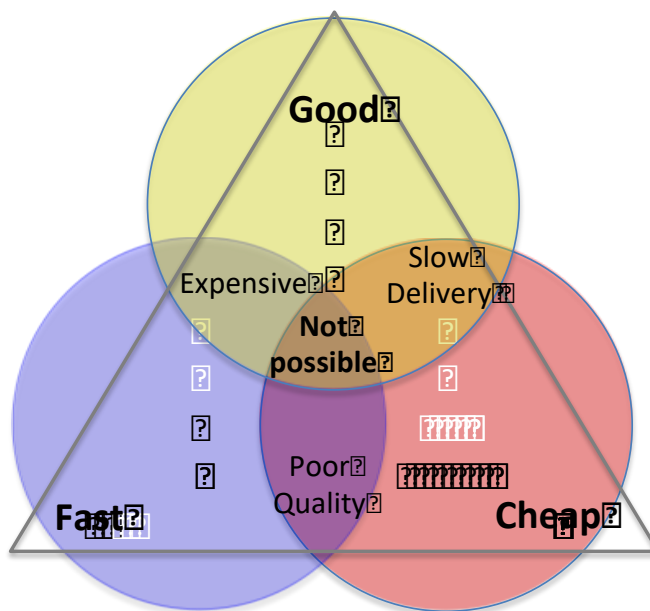


Figure 5.7 Good-Fast-Cheap project delivery triangle

In project management and delivery, you can only pick two of the three of the corners of the good-fast-cheap triangle. And, if you pull too hard on any one corner, you may only get one of the three.

The OSHA PSM regulation requires duration limits for *any* MoC project. Ironically, it is more appropriate to apply a universal definition to “permanent” than “temporary” when defining change duration, although the reverse is generally done.

3rd, finally and importantly . . .

Many companies may misread or misinterpret the language and intent of regulation and guidance.

The OSHA PSM regulation [1] and well established industry guidance, such as *CCPS Guidelines for the Management of Change for Process Safety* [2] never state that *universal* limits are required for temporary MoCs. The OSHA PSM regulation does *not* define a maximum length for the duration of a temporary change. Likewise, *CCPS Guidelines for the Management of Change for Process Safety* [2] does *not* define a maximum limit. The regulation states and intends that *each* temporary MoC have a duration period stipulated and that the change is appropriately designed, reviewed, and approved considering that duration.

6.2.3 Truth 2: Each Temporary MoC must be designed to meet a specifically stipulated duration limit. Universal caps on duration for temporary MoCs are neither appropriate nor effective.

6.3 Myth 3: *Converting a temporary MoC to a permanent MoC is an acceptable practice especially for longer duration temporary MoCs.*

6.3.1 History:

Allowance for conversion of temporary MoCs to permanent MoCs is frequently stipulated within company procedures as one of several ways to disposition a temporary MoC that is approaching its deadline.

The following choices are often provided in company MoC procedures as options for addressing the temporary change before the expiration date [4][8][9]:

- At the end of the duration limit, the change shall or must be:
 - Removed or reversed and the plant restored to original condition OR
 - Converted to a permanent change OR
 - Granted an extension

Where extensions are not allowed, the extension option is removed leaving two choices, neither of which may be technically acceptable or feasible.

Note: Shutting-down the equipment, process, or facility should always be considered as an option, but shut-downs are rarely given as one of the options to consider upon approaching the due date. Of course, shut-downs and start-ups present inherent safety risks as well. But a shut-down may be the only technically acceptable option depending on the options made available.

If a temporary change (of defined limited duration) is converted to a permanent change (of indefinite duration), an essential basis for the prior design and approval has been changed.

Therefore, the original approval is fully invalidated. Any conversion necessarily requires review by any and all prior reviewers and approvers of the temporary MoC (or equivalent discipline representatives).

Regarding conversion administration, in some companies the original MoC record may be redefined as permanent. In other companies, conversions are accomplished by opening and approving a new MoC record describing the same change****. This method of handling the conversion tends to be cleaner administratively allowing for accurate reflection of history, clarity of the scope, insertion of new technical, safety, environmental, operational, and managerial reviews, and documentation of new authorizations. Also, the new permanent MoC will require final updates of all applicable PSI, whereas updates for PSI associated with temporary MoCs may have differing protocol and requirements regarding format and timing. The two MoCs should be related or cross-referenced to each other in the administrative system.

**** Note: If a new MoC record is opened that describes a new change or condition, then the new MoC is a new permanent change rather than a conversion, although still related to the temporary MoC.

The three disposition options described above, or two where extensions are not allowed, are broadly applied throughout industry. The same choices are also reflected in technical articles [4] [15] on the topic.

6.3.2 Alternative Perspective:

This approach of offering conversion to permanent as a method for managing temporary MoCs approaching their due date – while well-intended - is inherently flawed and inherently unsafe. This approach will inevitably lead to unintended consequences that could introduce more risk into the operation. Here's why, . . .

Conversion of a temporary MoC to a permanent MoC should not be allowed unless the conversion is based on one of a set of defined and defensible reasons. Possible legitimate reasons for conversion of a temporary MoC to permanent could include: 1) there was a technical error in the initial assessment, 2) a global company standard or specification has been relaxed specifically impacting this change, 3) another system change has occurred impacting this change (such as safe operating limits have shifted and those new limits have been separately technically approved), 4) the change was a Category 6 change called temporary for business reasons only, not technical or safety reasons, or 5) the change fell into another category due to original duration intent only but meets all standard technical, safety, and operational protocol for permanent operation and is now intended for indefinite operation in the current configuration.

Bumping up against an arbitrary temporary MoC duration limit is *not* one of those reasons. If criteria are met that allow for conversion, all process safety information updates must occur as per protocol for permanent changes.

Temporary MoCs are typically defined as temporary because the change is unacceptable technically to remain in place for an indefinite timeframe as a permanent installation. Conversion of a temporary MoC to permanent is, therefore, inherently problematic.

Note: Closure of temporary MoCs via conversion to permanent MoCs, if allowed by the company, should be a red flag to auditors. If not based one of the reasons given above or other legitimate reasons defined by the company, the approval of the conversion to permanent may not be justifiable or technically sound.

Temporary MoCs that are inappropriately converted to permanent MoCs place the operating company at higher risk, as the flagging system based on the temporary MoC expiration date will be removed. The change will no longer be flagged in the system and will, therefore, be less visible for further review, monitoring, and closure. Additionally, drivers for outages will be masked when the temporary designation and associated due date is removed.

6.3.3 Truth 3: Converting a temporary MoC to permanent MoC is rarely an acceptable practice. Call a spade a spade, or we induce bad behavior and bad outcomes!

7 Two Wrongs Make a Wrong!

Much literature has been written regarding common problems associated with managing temporary MoCs [15]. There seems to be little recognition that the problems may in fact be self-fulfilling prophecies when our management systems steer personnel down paths toward failure. For example, Ozog and Stickles [15], describe common quality “problems” seen with regard to managing temporary MoCs.

Temporary changes

The documentation, closure, and communication of temporary changes are often cited as major quality issues in MOC programs. Common issues include:

- a. *The authorized time period expires without removing or making the change permanent.*
- b. *The change is made permanent, but is not reflected in the piping and instrumentation diagrams (P&IDs) and other process safety information (PSI).*
- c. *The change is improperly or incompletely removed [15].*

Causes for these problems are embedded in the problem statements. Conversions to “permanent” are not technically acceptable for a true temporary change, but are frequently inappropriately applied in order to manage deadlines that are neither realistic nor appropriate.

Many of these MoC conversions are being driven by the combination of these two problematic requirements being coupled onto temporary MoCs: arbitrary universal duration limits that are too short *and* allowance for conversion of temporary MoCs to permanent MoCs as a standard, sanctioned method of resolution when MoCs approach these arbitrary deadlines.

In other words, we are fabricating a problem that should not exist by applying an unnecessary constraint, . . . and we are giving people an inappropriate tool to deal with that “problem.”

Humans that are forced to make a decision between several untenable choices will inevitably make a poor decision. These types of errors in human decision-making that are propagated by management system flaws are routinely found to be causal factors for major and minor industry incidents [16]. As stated in CCPS, *Recognizing Catastrophic Incident Warning Signs in Process Industries*: “Management system deficiencies are a root cause in all effective incident

investigation methodologies [16].”

Insidiously, these MoC procedural constraints and requirements may actually build defects into the operation. Auditing to those procedures can introduce even more defects into an operation, as well.

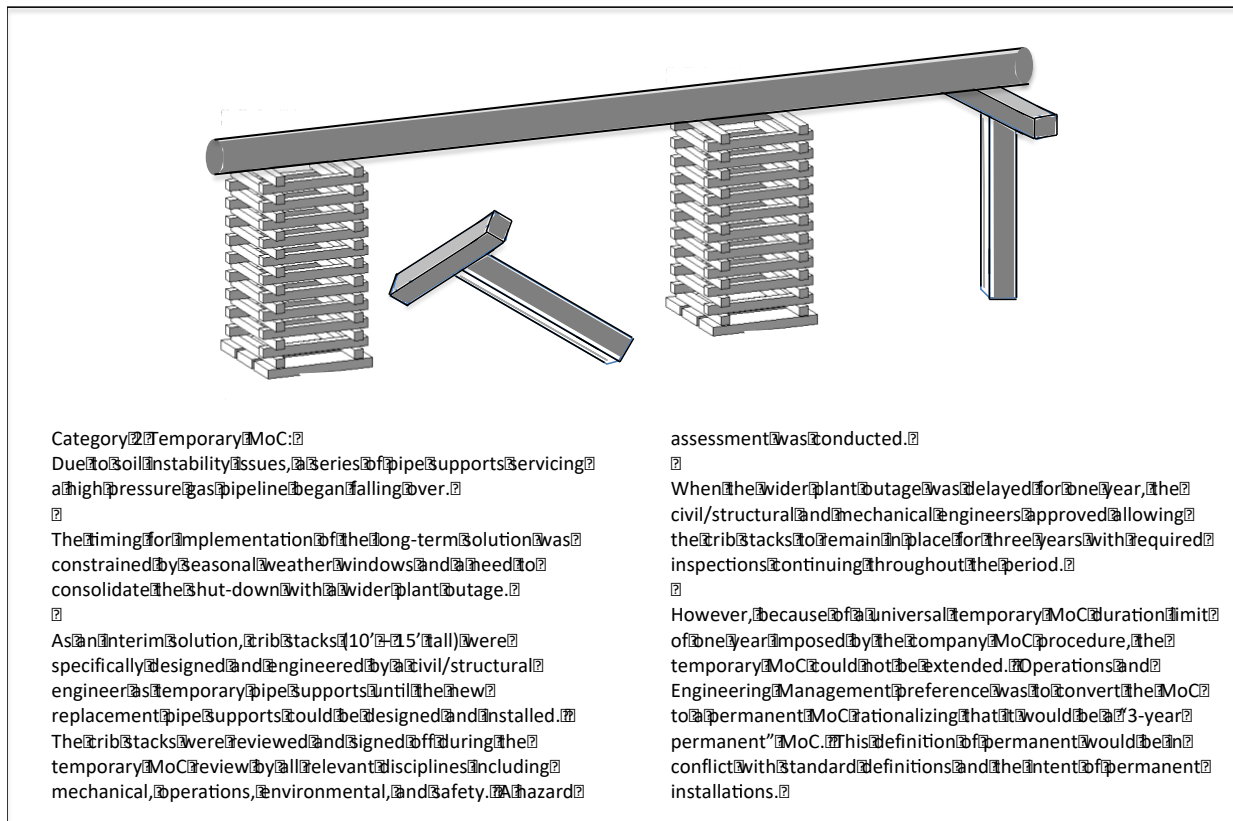


Figure 5. Example 2: Category 2 Temporary MoC - Interim Pipe Supports, Tall Crib Stacks

8 Conclusions/Recommendations

The following recommendations are offered as preferred practices for managing temporary changes:

1. Recognize that there are distinct categories of and reasons for implementing temporary MoCs.
 - Consider defining the temporary change category in the header information in order to better define likely lifecycle range for that change.
 - Recognize that many temporary MoCs are interim solutions associated with failures (Category 2 or 3b). Those MoCs require implementation of another project, the long-term solution, as a prerequisite for closure of the temporary MoC.

- Cross-reference temporary MoCs that are interim solutions for failures (Category 2 or 3b) with permanent MoCs that are the long-term solutions for the same failure.
- Define and monitor critical path item(s) that will define closure timing.
- 2. Do not dictate universal fixed duration limits for temporary MoCs in company management of change procedures. Design the change considering safeguards and including inspection and maintenance requirements in order to meet company risk protocol and safely operate for the intended duration of the change.
 - Ensure that every temporary MoC has a specified duration limit defined for the specific change as a requirement for approval. In electronic systems, expiration date should be a required field.
 - Note: The OSHA PSM regulation does not require a universal fixed limit on temporary MoC durations.
 - Consider real world constraints when setting the temporary MoC duration such as: materials deliveries, resource availability, shut-down opportunities, etc. Incorporate contingency into setting expiration dates.
 - Refer to Figure 3 and Appendix A for temporary MoC review and approval work flow process that considers duration requirements as an input to the design and review process.
 - Develop internal company protocol that addresses PSI management needs for MoCs of varying temporary lengths.
 - Define the meaning and duration of “permanent change” globally within the company management of change procedures.
- 3. Conversion of temporary MoCs to permanent should rarely be allowed. An inappropriate conversion could create a hidden or latent process safety hazard.
 - Define a listing of acceptable reasons that temporary MoCs may legitimately be converted to permanent. Allow conversion only if one or more of those conditions is met.
 - Note: A temporary MoC that is approaching an expiration date is not an acceptable reason to convert the MoC to permanent.
 - Clearly define what conditions changed from the prior temporary MoC making the conversion allowable for each temporary MoC that is converted.
 - For the rare instances where conversions are allowable, initiate a new MoC and relate the new permanent MoC to the prior temporary MoC.

Many of the errors that have historically been associated with managing temporary MoCs may be directly attributable to constraints and flaws built into the management systems. Addressing these underlying issues will eliminate some of the causal factors for human error when using these procedures. Allowing personnel the flexibility to design, approve, and manage temporary changes based on the system need as well as the assessed risk will ultimately lead to more efficient and resilient [17] work processes and safer, more reliable operations.

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APPENDIX A

Work Flow Process: Temporary MoC Review and Approval
with more complex alternatives analysis

