Guidance Notes On

Management of Change for the Marine and Offshore Industries

February 2013

GUIDANCE NOTES ON

MANAGEMENT OF CHANGE FOR THE MARINE AND OFFSHORE INDUSTRIES FEBRUARY 2013

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Foreword

Change is inevitable within any type of business. It arises from the need to respond and adapt to varying conditions. Modifications may be required to the equipment, operational policies, and organizational structure or personnel. Whenever a change is made, the potential consequences of that change should be assessed before implementation. History has illustrated the potential negative consequences associated with uncontrolled change.

If a change is technically inappropriate, poorly executed, its risks poorly understood, or management fails to ensure communication to key personnel, accidents or other undesired consequences can result. Thus, a formal and effective management of change program plays a critical role in preventing accidents and losses. A management of change program is one of the most challenging aspects of a safety management system to implement successfully. It requires organizational support, assignment of necessary resources, and a clear, defined process. ABS offers these Guidance Notes to the maritime and offshore industries as a tool to aid in the development and implementation of an effective management of change strategy to optimize existing safety and risk management efforts.

These Guidance Notes become effective on the first day of the month of publication.

Users are advised to check periodically on the ABS website www.eagle.org to verify that this version of these Guidance Notes is the most current.

We welcome your feedback. Comments or suggestions can be sent electronically by email to rsd@eagle.org.

GUIDANCE NOTES ON

MANAGEMENT OF CHANGE FOR THE MARINE AND OFFSHORE INDUSTRIES

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SECTION 1
Introduction

1 General

A Management of Change (MoC) system is a combination of policies and procedures used to evaluate the potential impacts of a proposed change so that it does not result in unacceptable risks. Developing an effective MoC strategy requires establishing, documenting, and successfully implementing formal policies to evaluate and manage both temporary and permanent modifications in the facility or ship including equipment, materials, operating procedures and conditions, and personnel.

These Guidance Notes highlight key considerations for developing and maintaining a successful MoC process for ships and offshore facilities. The process is consistent with safety and environmental management systems (SEMS) best practices.

These Guidance Notes explain the core principles to be considered and describe key functions and interrelationships for consideration at various levels of a representative organization. Supplemented by models and examples to be used in planning and developing an effective MoC system, these Guidance Notes are intended to educate and assist management representatives and personnel responsible for initiating and coordinating changes.

Successful organizations are dynamic and constantly undergoing change in striving for innovative and cost effective solutions to achieve sustainability in a robust and competitive business environment. A disciplined management of change system will not only minimize significant impacts on safety and the environment, but will incorporate strategies in managing the associated business risks on quality, continued commerce, and security.

3 Why Manage Change?

History has many examples of inadequately managed changes that resulted in catastrophic accidents. A well-documented MoC program can be used to demonstrate an organization's commitment toward due diligence in risk mitigation efforts.

There are characteristics relative to the nature of marine or offshore operations which convey heightened importance on the implementation of an effective MoC program. For example, the limited space for emergency spares means that many emergency repairs carried out at sea are to remain until appropriate spares can be procured. Similarly, limited crew, crew fatigue, and crew turnaround can lead to the implementation of changes whose associated impacts are not thoroughly understood.

Risk management strategies and strong administration form the basis of an effective MoC program. An ability to sufficiently analyze and understand the effects and consequent risk associated with the impact of a proposed change will provide the organization with vital insight in deciding upon and concluding change.

Designing safety into the MoC program can effectively decrease the occurrence of undesirable change-induced incidents. Studies into the causes of incidents reveal that severe injury accidents occur at a disproportional rate during unusual and non-routine work activities. The establishment of policies to manage equipment, operational and organizational deviations from the existing condition will improve safety, promote environmental compliance, safeguard property, and preserve business reputation.

SECTION 2
Recognition of a Change

1 Program Scope

A system that requires change management to be carried out for every single modification is likely to become onerous and circumvented. For this reason, it is important to pay special attention to the activities and systems for which the MoC program will be implemented, the life-cycle applicability of the MoC, the type of changes to be evaluated, and boundaries and overlaps with other administrative programs or elements.

1.1 Activities and Systems within the MoC Program Scope

An MoC program can include the whole enterprise, or alternatively, have a physical scope limited to certain systems or activities. The reasons for limiting the scope on the program can stem from the desire to enhance the effectiveness of the program, or the fact that the program was born to help deal with problems in a specific area, or to support a regulatory compliance effort.

The criticality of a system or activity can be used as a parameter for determining whether or not a system should be part of the MoC program scope. The premise is that impacts associated with a critical system change are likely to be of serious consequences, thus managing through an MoC program could make a significant and positive difference.

The systems and activities that may be considered critical in a marine environment because of their potential health, safety and environmental impacts, will depend heavily on the type of ship or offshore facility, the operations carried out, and the hazardous materials/cargo handled. 2/1.1 TABLE 1, shows typical examples of systems and high level activities which may be considered critical. Note that each activity involves numerous types of subtasks, all of which should be governed by an MoC program. For example, construction activities in the offshore industry include initial construction, onsite construction, repairs, modifications, pipe laying operations, sand blasting and painting, welding, crane operations, electrical equipment modification, facility decommissioning, etc.

TABLE 1
Critical Activities/Systems Typically Governed by an MoC Program

Offshore	*Marine*
• Drilling • Production • Processing • Construction • Well Services (workover, completion, servicing) • Pipelines	• Propulsion • Steering • Navigation • Cargo (containment, handling and monitoring) • Structure (repair, modification, sand blasting, welding, hoisting/lifting, electrical, etc.)
Common to Offshore and Marine	
• Emergency systems (fire protection, gas detection, life saving, life support) • Ballast control • Communications • Hazardous areas • Security • Supervisory control systems (computer programs) • Fuel gas • Utilities	

Note that although criticality of systems is used as criteria for a limited-scope MoC program, changes in non-critical systems can also present significant impacts, thus greatly justifying the need and benefits of more comprehensive MoC programs.

Scope of MoC Program – Contracted Equipment and Personnel

In offshore activities, reliance on specialized contracted operators presents some unique challenges. For example, an offshore lease-holder company field utilizes mobile offshore drilling units, owned and operated by a drilling contractor, for drilling, construction, well servicing, etc. These activities can present significant health, safety, and environmental impacts. All parties involved are likely to have some degree of liability if an accident occurs during these activities. The lease-holder company shall require an MoC program for these critical activities, even when carried out by contractors. The contractors may have their own MoC program to manage changes, but the lease-holder must be satisfied that is in line with the lease-holder's goals from such a program and that it is functioning adequately.

1.3 Life-Cycle Phases

The MoC process is applicable throughout the life-cycle of a ship or offshore facility, but it may be distinctively applied at each stage. When developing an MoC program, one important aspect to define is the life-cycle stages for which it will be required.

A typical breakdown of the life-cycle of a ship or offshore facility would include the following stages:

- Design

- Construction
- Start-up
- Operation (including inspection and maintenance)
- Dry-dock or extended shutdown
- Decommissioning

The techniques used to evaluate the change, the people available for review and approval, the time frames for reviewing and implementing the change, etc., will differ between stages. During a facility design stage, there are many changes, but there will be fewer records to update than if the change occurred at an operating stage of the facility. When evaluating changes at a design stage, the impact or risk assessment techniques, which are a strong function of the available information, may be different than for more mature life-cycle stages. Tools such as software simulations, quantitative risk analysis, etc., prove invaluable at the early stages, even though they are more effort and resource intensive.

At operating stages, the changes will require a larger amount of information to be reviewed and updated such as drawings, maintenance and inspection plans, training programs, emergency plans, etc. In older operating ships or offshore facilities, the access of information may involve old paper records instead of completely electronic documentation.

Towards the end of life, the change management may be simplified. It may involve fewer closeout tasks, fewer updates of associated documentation, less rigorous sign-off procedures, limited or no training needed as a result of the changes, etc. There will be a decommissioning plan, where the impacts of all the activities planned have been carefully analyzed and mitigated against. The definition of the types of changes to be managed may then become “deviations from the decommissioning plan”.

1.5 Types of Changes

Most changes controlled by an MoC program fall into one of the following categories: equipment, operational or organizational changes.

1.5.1 Equipment

This category addresses equipment or technological changes. Examples of equipment changes may include:

- New equipment
- Replacement or modification of equipment (equipment, ship components, infrastructure including emergency replacements when out at sea)
- Replacement or modification of computer hardware
- Modification to software (logic, interlocks, controls, alarms, instrumentation)
- Bypasses around equipment that is normally in service
- Disabling of safety/critical systems for testing, calibration or repair/replacement, if not covered by procedure
- Modification or removal of safety equipment (fire-fighting equipment, first aid equipment, escape and evacuation, personal protective equipment, etc.)
- Changes to structural support, layout, or configuration
- New maintenance chemicals
- New/changed solid/liquid/gas effluents (e.g., produced fluids, waste products, by-products)
- Change to the utilization of an equipment
- Changes resulting from recommendations originated from non-conformances, root-cause analysis, hazard identification studies, etc

- Contracted equipment and facilities (e.g., drydocks, repair facilities, contracted drilling equipment for offshore, etc.)

Marine-specific examples include the acqusition of a new ship into a fleet – it could be a sister ship or a completely new type of ship. Offshore-specific examples include new production or process facilities, newly acquired facilities, new fluids used (e.g., process additives, drilling muds, workover completion fluids, pipeline utilization change).

1.5.2 Operational

Changes in administrative controls or management system that define the way processes are conducted throughout the organization. Examples of operational changes include

- Deviation from preventive maintenance or mechanical integrity programs
- Deviation from inspection program or testing frequency
- Deviation from testing methods
- Deviation from repair requirements
- A response to external circumstances that is not defined in standard procedures
- Change to a controlled document
- Implementation of new procedures
- Operations outside current operation procedures and parameters

Marine-specific operational changes include change in trading patterns, new routes or ports, change of ship type (e.g., multi-purpose vessels (when changing between modes)), change in cargo (different specs or new cargo type (e.g., food/fuel)). Offshore-specific operational changes may include changes with personnel transfer to and from the offshore facility such as different or larger aircraft or vessel or other logistics change, deviations from well construction/execution plan, deviations from a simultaneous operations (SIMOPS) plan, etc.

1.5.3 Organizational

This category includes personnel and staffing modifications, such as changes to crew, personnel, management structure, shift manning, company-wide policies, regulations, etc. Changes such as realignment of organizational resources resulting from acquisitions, mergers, new joint ventures and alliances should be evaluated to provide consistency with health, safety, quality, and environmental (HSQE) objectives and to minimize adverse effects on the enterprise risk. When organizational changes take place (changes in reporting relationships, elimination of positions, restructuring, etc.), a change control is needed to verify that the reassignment of responsibilities is clearly evaluated and explicitly documented. More examples of organizational changes may include:

- Changes to onboard management
- Crew turnover/crew change-out by a predetermined percentage
- New crew on board (e.g., different reporting requirements)
- New contractors (e.g., repair crews, crewing agencies, dry docks, repair facilities, etc. For offshore, the list can be extensive: well services, drilling contractors, crew transportation, etc.).
- Transfer of Class
- New and forthcoming regulations
- Acquisitions, mergers, new joint ventures and alliances
- Elimination of positions or restructuring

- Change of key shore-based staff supporting the ship or offshore facility
- Flag change or new flag into fleet
- Crew new to company or new full crew nationality

There may be changes that overlap one or more categories (for example, a major technological change may necessitate modifications to equipment, operations and organization). These categories illustrate to the developers and users of the management system what may constitute a change. However, the MoC process set forth in these Guidance Notes is the same regardless of the type of change.

1.7 Changes not Subjected to the MoC Program

Addressing all types of modifications with the MoC program will undeniably reduce the overall effectiveness of the system without adding significant risk reduction. Types of changes typically not governed by the MoC program include the following:

- Replacement in kind
- Changes that the company chooses to control via other management process such as:
  - Routine personnel changes (crew rotation, shift or tour changes) controlled by operating procedures, safe work practices, training, etc.
  - Routine in-service changes where the operating procedures provide appropriate guidelines for the change, and the operating procedures have been adequately reviewed prior to becoming effective
- Domestic activities (janitorial, food, beverage, laundry, housekeeping, etc.)
- Other types of changes as defined by the company

Replacement-in-kind and changes controlled via other management processes are described in more detail in the following Subparagraphs.

1.7.1 Replacement-in-Kind

A replacement-in-kind is a change wherein an item, process, or person meets the specified criteria for the item it is replacing, if such criteria exist. This may take the form of an identical replacement, or an alternative that is specifically designed within specifications criteria and therefore will not adversely affect the function of the system.

An MoC program should disregard changes that constitute a replacement-in-kind and focus on evaluating proposed temporary or permanent changes that are outside of the existing specified criteria.

It is true that even a replacement obtained from the same manufacturer may have small differences from the original item it is replacing. The manufacturer may have utilized upgraded machinery, employed slightly different materials of construction, or may have stored the equipment at different environmental conditions. However, these physical changes may be considered minor component modifications that fall within the tolerable range of existing documented specifications. The limited risk of replacement-in-kind can be controlled outside the MoC program using other tools such as purchase requisition processes, checklists, safe work practices, etc.

1.7.2 Change Control via Other Administrative Systems

MoC is only one system among many management system practices normally in place within an organization. A shipping or offshore company will likely have comprehensive administrative systems to manage designated issues such as procurement, crew staffing, project management and job risk assessment, just to name a few.

An organization may opt to employ these administrative systems to control certain types of ordinary changes without the need of the MoC program. This point can be illustrated by looking at project management during design and construction. One of the best methods of preventing and controlling occupational injuries, illnesses, and fatalities is to "design out" potential risks early in the design process. During preliminary design stages, changes are constantly taking place as more detailed information is presented and the technical blueprint matures. It is impractical to consider implementing an MoC for every change or option contemplated by design (and sometimes construction) teams. Nonetheless, a control mechanism for change management should be effectively incorporated into project management so that changes are monitored through to completion to minimize the potential risk of failure in project objectives, and in turn, improve safety through design.

Careful consideration should be taken in aligning the MoC process with or developing it in conjunction with existing company policies and regulatory requirements. An organization may choose to control certain changes outside of the MoC program by employing their uniquely customized strategy for controlling the risk of the change. Activities whose changes are to be controlled under other administrative programs should be documented as clear exceptions to the MoC program.

Interfaces with other safety management processes should also be outlined in the MoC program. The MoC program will most likely receive inputs from and provide outputs to other business areas. For instance, proposed changes involving equipment replacements are likely to request, as well as provide, equipment specifications data to the procurement department. Similarly, the review of a proposed personnel change onboard, will need data on competencies, education, training, and experience on the personnel involved in the change from human resources and staffing. The interrelationship of core activities and policies should be well defined and understood to avoid duplication of effort, or omission of important activities. Early consultation with personnel responsible for comparable management processes currently in place in the organization is key to promoting efficiency in the MoC program design.

Controlling Changes Outside the MoC Program – Sometimes It Makes Sense

A new sailing route is a common type of change for a ship. Before sailing on a new route, there are many issues that need to be evaluated to determine their significance and what actions may be required to deal with them:

- *Navigation (up-to-date charts and navigational aids)*
- *Tides and weather*
- *Pilots*
- *Security (up-to-date information on war/piracy activity)*
- *Additional traffic*
- *Crew familiarity*
- *Under-keel clearance*
- *Communication*
- *Sovereignty*
- *Duration (water, fuel, provisions),*
- *etc.*

The evaluation of these issues is standard duty for the navigating officer (usually the second mate) responsible for defining the voyage. The navigating officer is likely to use a checklist for navigational plan changes, as well as discuss the planned voyage with the master who would sign off on it. This is normal and routine practice and the subject of extensive professional training and judgment. Subjecting this evaluation to new requirements using the MoC system will likely be unnecessary, and add extra burden to personnel at the bridge. Route changes are thus, a good example of a change that most marine companies would choose to control using processes outside the MoC program.

3 Recognition of a Change

All employees should have the liberty to suggest modifications that they believe will have a positive impact on their workplace. The MoC process is initiated when someone, anyone, either identifies the need for change, or recognizes that a change situation is developing.

The first consideration after recognizing a potential change is deciding whether or not the change is a replacement-in-kind. When there are no specifications or guidelines available, it is up to the judgment of those involved in the change to decide if it is an in-kind replacement. There are three questions that should assist in this decision.

i) Does the change involve identical specifications?

ii) Does the change involve identical service parameters?

iii) Is it a routine replacement?

A positive answer to ALL three questions usually confirms an in-kind replacement. The considerations on how the change affects the factors mentioned in 2/3 TABLE 2 can also aid in the determination of whether a change is in-kind or not.

TABLE 2
Factors for In-Kind Determination

Specifications Physical, mechanical, electrical, or chemical specifications	Considerations should include materials of construction, measurements, grade weight, strength, tests, performance, maintenance chemicals, etc. A change in vendor or manufacturer for the item should trigger a management of change process which involves procurement as well as the responsible technical personnel.
Service Operating conditions/range	Service temperature, service pressures, fluids to which replacement item is exposed , if exposed to atmospheric conditions, etc.
Routine Replacement is due to item being at the end of its usable life	Replacement at the end of the item's usable life. If the replacement is an upgrade, then it should be treated as a change. Routine replacements that are occurring more frequently than anticipated could indicate a persistent problem with the item. In such cases, an investigation should take place to determine if an underlying change condition may have developed and be the cause of the failures.

When attempting to evaluate 'non-physical' modifications such as those to personnel, organizational structure, reporting, and procedures, it is considered best practice to employ the assistance of competency and training matrices in deciding if the adjustment may present a risk to current operations and be considered a 'change' in the work environment. These matrices would include factors such as competencies, length of service, experience in industry, training with similar systems/equipment, etc. Any specifications such as existing policies, processes and procedures, organizational charts, etc., should be considered in deciding if a proposed organizational change constitutes a replacement-in-kind.

If doubt persists regarding whether a change is in-kind, the conservative and safe approach is to proceed with the MoC process, or consult with the company's MoC coordinator who can help with the determination.

2/3 TABLE 3 provides typical examples of change scenarios that can be encountered in the marine and offshore industries and reasoning to assist the decision of whether or not they are to be controlled by the MoC program.

TABLE 3
MoC Decision Checklist for Typical Marine and Offshore Changes

Change	***If the Answer to Any Question is "No", Change is to be Controlled by the MoC System***	***Yes***	***No***
Ship/Facility Mode	• Is the new mode of operation equivalent to a previous mode of operation that was managed successfully? • Is the present crew familiar with this mode of operation? • Have all shore and shore-interface modifications for the new mode of operation been carried out before? • Does mode change require modification to procedures and manuals?	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐
New equipment or software	• Does the new equipment have same performance, functional, material, maintenance, control systems and dimensional specifications as old equipment? • Are the existing procedures applicable to this new equipment?	☐ ☐	☐ ☐

Change	*If the Answer to Any Question is "No", Change is to be Controlled by the MoC System*	*Yes*	*No*
New hazardous cargoes/ hydrocarbon/ chemical	Does new cargo/hydrocarbon/chemical have similar properties to previous in terms of: • Fire and explosion • Toxicity • Corrosiveness • Reactivity • Spill response • Physical properties (boiling and freezing points, thermal expansion, decomposition, vapor pressure) • Chemical compatibilities with other cargos/materials handled?	 ☐ ☐ ☐ ☐ ☐ ☐ ☐	 ☐ ☐ ☐ ☐ ☐ ☐ ☐
Handling new cargoes/ material	• Are existing equipment and crew skills adequate for safe handling, loading or unloading of the new cargo/material? • Are procedures for handling new cargoes/materials available?	☐ ☐	☐ ☐
Personnel	• Does the new candidate meet the competencies, training, education, and experience requirements for the position? • For organizational changes ashore (eliminating positions, restructuring, etc.), do reporting relationships, job responsibilities, work load, etc., remain unchanged?	☐ ☐	☐ ☐
Contractors	Changes to contractors working in areas or activities so designated by company or regulation, should be subject to MoCs, unless the contractor change is a "replacement-in-kind". A positive answer to all the questions below is a good indication of replacement-in-kind. • Have contractors worked with company before? • Are contractors familiar with company regulations and personnel? • Have contractors worked with this type of ship/facility before? • Have contractors worked with this type of equipment before? • Have contractors worked in this location before? • Have contractors been qualified (competency, financial, insurance, billing) by the company before? • Will there be company resources to properly monitor and supervise the quality of the work and the safety of the contracted personnel?	 ☐ ☐ ☐ ☐ ☐ ☐ ☐	 ☐ ☐ ☐ ☐ ☐ ☐ ☐
Corrective Action Requests/ Hazard Analysis Recommendations	Changes initiated as a result of a non-conformance, corrective action, incident investigation, hazard analysis, etc., can have the potential to affect onboard and shore operations and as such should be evaluated via the MoC system. • Is the change a replacement in kind? • Is the type of change exempt from the company's MoC program?	☐ ☐	☐ ☐
New regulations, procedures, standards, registry	The preliminary impact analysis may take the form of a gap analysis to identify the new requirements proposed and how the new requirements change the current ways. This type of change almost always requires an MoC to comprehensively identify potential impacts and develop an implementation plan.	MoC almost always required.	

SECTION 3

Management of Change Process

1 Terminology

Approver. A member of management or senior officer who reviews the initial change form to confirm the need for change and validate the preliminary impact assessment and the implementation plan. If the change has major impacts and it is particularly complex, the approver is strongly suggested to request further detailed risk assessment. Ultimately, the approver decides if the change can be executed.

Change. Changes are modifications, additions, or substitutions for any aspect within the organization that are outside the company's present specifications.

Change Owner. Supervisor/officer with responsibility in the area where the change is proposed and who works with the initiator in preparing the change form request. If the initiator shipboard is an officer or above, then the initiator and the change owner are one and the same.

Initiator. Person proposing change or identifying an occurring latent change. It can be anybody within the company. The initiator works with the change owner to prepare the supporting documentation requested by the MoC program

MoC. Acronym for "Management of Change". It is also used to refer to a proposed change that is going through the management of change process.

MoC Form. The MoC form is essentially the record for each change. The form is essential to allow the necessary information to be gathered and recorded efficiently and effectively.

MoC Log. The MoC log functions like a register or record book of all changes onboard. The information contained in the log can show at a glance which changes are open, which are about to expire, and which are late and where actions need to be taken. The MoC log can be paper-based or electronic.

Onboard MoC Coordinator. Someone onboard who keeps a log of all the MoCs and current status of each change. This may be one of the onboard engineers whose responsibility is similar to those of the shore-based MoC coordinator. His/her job is to verify that changes are completed in a timely manner and updated and closed out as required. The onboard MoC coordinator has the responsibility to see that all the change owners onboard are on track with their MoCs.

Replacement-in-kind. When an item, process, or person meets the existing specified criteria for the item it is replacing, it is typically not considered a change, but a replacement-in-kind.

Shore-side MoC Coordinator. The shore-side MoC coordinator tracks MoC program performance, including the status of MoCs and MoC actions, and undertakes audits of MoC programs fleetwide. This role typically falls upon someone shore-based with HSQE responsibility, although a ship may have an onboard MoC coordinator in addition to the shore-side coordinator.

3 MOC Process

Regardless of a company's culture, organization, values, and programs, the key steps discussed in this Subsection should be considered when designing any formal management of change program. The process set forth in these Guidance Notes defines six distinct steps, as follows:

i) Initial Review

ii) Senior Review

iii) Detailed Risk Assessment

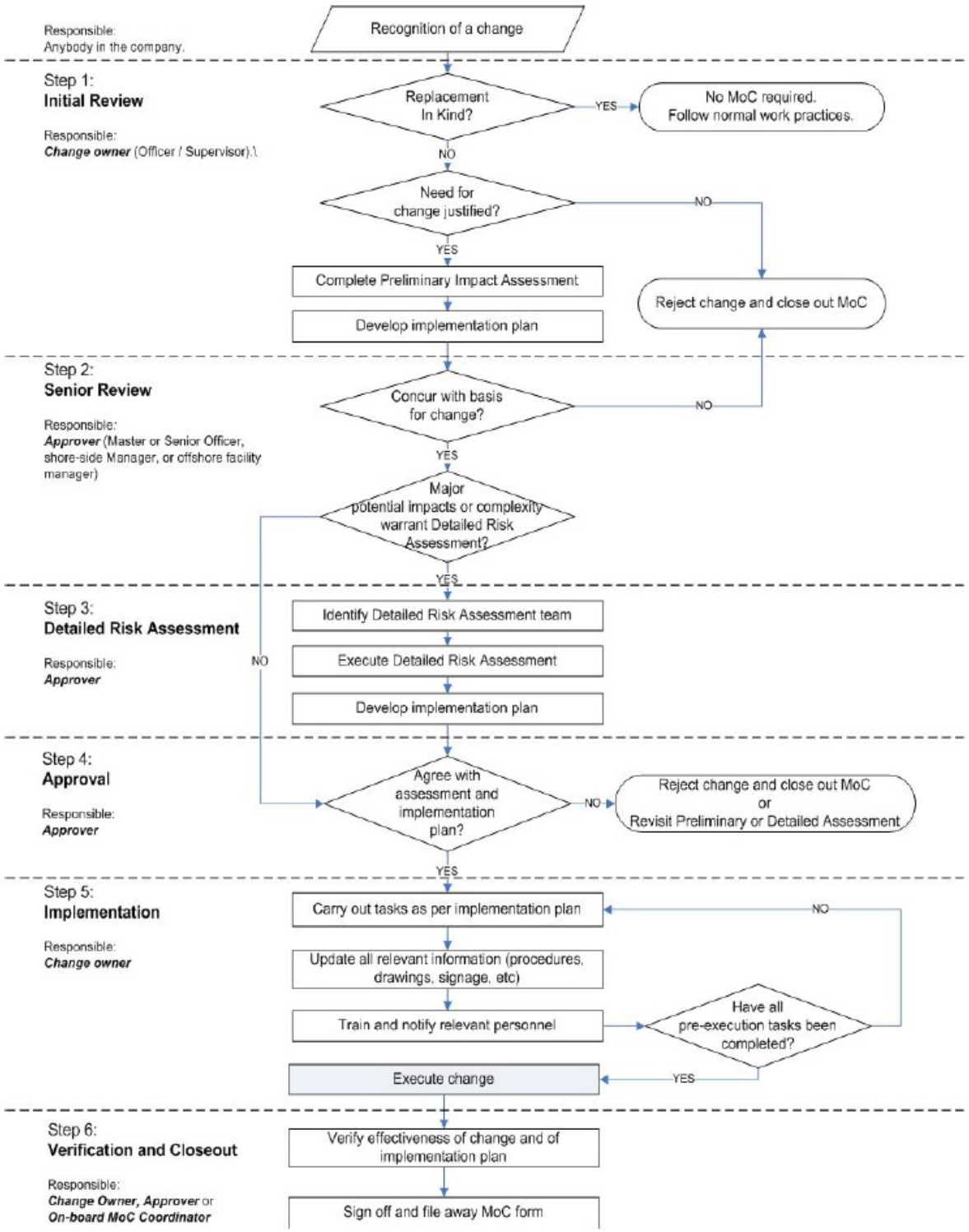
iv) Approval

v) Implementation

vi) Verification and Closeout

An overview of the MoC process is depicted in the flowchart of 3/3 FIGURE 1.

FIGURE 1
MoC Process Flowchart



5 Initial Review (Step 1)

This step involves stating the justification for the change, as well as developing an initial assessment of the hazards associated with the change and proposing an implementation plan with risk control options.

An Initial Review would typically involve completing a checklist or initial sections of the MoC form to guide the user through the required analysis. It would typically address the following aspects:

i) *Justification and Coverage* – Is the change needed? Is it a replacement-in-kind and thus outside the MoC program? Is it to be controlled via the MoC program or some other management system?

ii) *Preliminary Impact Assessment* – What are the potential impacts of the change? The change owner and initiator are required to brainstorm the potential consequences of the change. In particular, the possibilities of significant safety, environmental, economic, and business implications should be listed.

iii) *Implementation Plan* – What controls are proposed to reduce the risk associated with identified impacts? How will the change be properly executed to minimize additional risk? A draft implementation plan should be set forth to indicate the way in which the change will be executed, including administrative or engineering control measures recommended to mitigate risks caused by the change. The plan should also detail actions concerning the update and development of documentation to support the design and operation of the revised system.

The MoC process described herein is targeted for permanent changes. However, two special types of changes, emergency and temporary, need to be controlled but demand slight modifications to the standard approach. It is very important to identify in this initial review if the change is emergency or temporary so that they are handled appropriately. The MoC process variations for controlling emergency and temporary changes is addressed in 3/17, whereas detailed guidance for conducting the Initial Review is given below.

5.1 Justification and Coverage

This task is essential to minimize the potential of starting an MoC process for a change that does not warrant it. As a starting point for any change proposal, there should be an explanation of the proposed modification, including the reasons why it is necessary and what is expected to be achieved. There should be enough description and detail to allow the approver of the change a clear understanding of the situation.

The initial reviewer should verify the applicability of the change within the MoC program by confirming that the change is a type of change covered within the company's MoC program and is not a replacement-in-kind.

Individuals that can find themselves in the capacity of performing Initial Reviews should be well versed in the MoC program to allow them to spot a change that does not meet program criteria for evaluation under the MoC program. The change owner should also have awareness of other mechanisms in place to control the particular change.

5.3 Preliminary Impact Assessment

Once it is decided that the change is a type that needs to be managed within the MoC program, the next task is to brainstorm the potential impacts associated with the change. A change is normally proposed because it is advantageous. However, a change that is not properly evaluated can also bring negative impacts that outweigh its benefits. The ultimate goal of an MoC program is to control the change process to minimize or eliminate any detrimental impact on safety, property, and the environment, as well as quality, security, or any other aspect of interest to the company.

The preliminary impact assessment is very important in an MoC program, and it should appropriately identify all potential impacts associated with the change. Training on hazard identification and hazard management is essential to secure completeness in the preliminary impact assessment. A useful tool to help the Initial Reviewers complete the preliminary impact assessment is a checklist, as well as prompts and guidance built into the MoC Form. A sample preliminary impacts checklist and MoC form can be

found in Appendix A1 and Appendix A2, respectively. Additional guidance on conducting impact assessments can be found in the ABS *Guidance Notes on Risk Assessment Applications for the Marine and Offshore Industries*.

The MoC program can be made more efficient if the detail and resources for the risk assessment are scaled up or down depending on the complexity and perceived impact of the change. Up to this point, the change process has involved the identifier of the change (initiator) and the change owner, which could be one and the same person. If the change is simple and impacts are deemed to be minor, the evaluation done by the initiator and change owner should suffice, and there is no need for further assessment. On the other hand, a change that has been preliminarily assessed during the Initial Review as having major potential impacts is likely to need further assessment to more clearly identify the potential outcomes and measures to mitigate the risks. These detailed risk assessments usually escalate the amount of resources and subject matter experts needed for the assessment, as well as the depth of the analysis, as described in 3/9.

Personnel and organizational changes require a special approach to identify risks. One such approach is mapping of tasks and individuals from the existing situation to the proposed one. The mapping involves identifying all personnel affected by the change and identifying the tasks each person carries out. The list of tasks must include their primary tasks and any special roles such as emergency responder, in addition to competences needed and time expected to be spent on each task. This information is then carefully compared checking that for each individual the workload is reasonable, simultaneous tasks can be realistically accomplished, that the competencies match the requirements for the task – or identifying the training needed to enable the personnel to carry out the expected tasks.

5.5 Implementation Plan

The implementation plan describes how the change will be executed and identifies specific actions, time limits, and responsibilities for addressing any HSQE issue or any negative impact prior to the change being implemented. Typical action items in an implementation plan would be to determine the specific controls to mitigate risks associated with the change, the types of notification needed, training, documentation, etc.

An implementation plan shall not only indicate the actions needed for the execution of the change, but also assign responsibility for each action and identify a timeline for the actions to be completed.

7 Senior Review (Step 2)

Once the impacts are assessed in the Initial Review, the senior review step involves presentation of the initial analysis to the designated approval authority. Before a change can be implemented, the approver should review and concur with the basis for the change, confirm that the preliminary impact assessment did not identify significant concerns warranting cancellation of the proposed change, and provide agreement with the implementation plan. If the approver has a concern regarding the outcome of the Initial Review, one of several alternatives can be chosen:

- The Initial Review is repeated but with a focused objective to provide substantial input in addressing the concerns raised by the approver, or
- The change is rejected, and the MoC form is considered ‘closed’ and retained for future reference.
- A more detailed form of risk assessment is requested to be developed and the resulting implentation plan approved before the change may be executed, as described in Step 3.

9 Detailed Risk Assessment (Step 3)

When the preliminary impact assessment identifies that the change has potential for major consequences, or the complexity of the change warrants it, then a greater degree of scrutiny is required to assess the potential risks. In these cases, the change owner or the approver is strongly advised to request a second more thorough and comprehensive risk assessment.

One of the main differences between the preliminary impact assessment and the detailed risk assessment is the number of people involved. The detailed risk assessment would be carried out by a team including subject matter experts from various disciplines. This detailed risk assessment should provide further clarification into the nature of risks to be controlled and as an output, produce a list of requirements or controls to be implemented before effecting change.

The risk assessment should be based on failure scenarios that force the risk analyst to think in terms of what could go wrong. The potential failure modes and impacts in a ship or offshore facility will vary depending on the operations it is undergoing when the failure occurs, thus all relevant operations are to be considered. Typical operations to keep in mind for a ship are loading/offloading, transit in open waters, transit in close quarters, laden transit. In an offshore facility, the list of operations is very lengthy, and would include drilling, production, construction, anchoring, heavy lifts, diving, simultaneous operations, etc.).

The full benefits of change management are only realized when the risk analyst takes a life-cycle approach in identifying issues associated with the change. The risks resulting from the change can occur before, during, and after change implementation. For example, before a change that involves tapping into an existing system is implemented, preparation activities can negatively affect an interconnected system. While the change is being executed, there are typical safety concerns for the people involved in the repair, as well as potential effects on the interconnected systems. After the change is implemented, the added load can result in problems with the existing system.

Typical failure scenarios should not only consider failures associated with all modes of operations, but also potential failures or impacts throughout the entire life cycle, such as:

- Removal of the old device/system/procedure
- Installation of the new system
- Transition from one state to another
- Change in place
- Maintenance to support the new system
- Safety and environmental concerns associated with decommissioning when end of life is reached

This is substantially more than just considering how the new system can fail and the consequences arising therefrom.

Once failure scenarios are identified, the consequences can be assessed on the basis of negative impacts to health and safety, the environment, crew and ship or offshore facility security, and financial/commercial values.

A wide range of risk assessment tools can be used to determine the extent of the potential risks (i.e., consequences and likelihood of occurrence). The following tools and techniques are typical examples of types of risk assessments performed for managing change:

- Hazard identification and assessments, such as What-If, HAZID, HAZOP, for equipment changes
- Structural analysis required by naval architects
- Engineering analysis required for equipment modifications
- IT analysis and approval for software changes
- Competency analysis required by HR for crew related issues.
- Legal analysis required by Legal Department to determine if a change contravenes prevailing legislation in different jurisdictions
- Organizational development analysis for an organizational change

Additional guidance on hazard identifications can be found in the ABS *Guidance Notes on Risk Assessment Applications for the Marine and Offshore Industries.*

The first step of a risk assessment is to identify all likely potential undesirable events and then to evaluate the risks they present in terms of how often they are likely to happen and how severe the consequences will be if the loss occurs. Once this information is ascertained, the next step is to determine how the risk, and therefore the change, will be managed. The detailed risk assessment outcome will typically lead to options such as:

i) Terminating the risk (i.e., do not proceed with the change)

ii) Managing the risk of the change using good technical experience, controls, procedures, engineering controls, etc., or

iii) Proposing alternative solutions to the problem that originated the change.

An important element in the decision is evaluating the costs of the selection and weighing them against the risks so that a reasonable decision can be made.

If the option to manage the risk is the one recommended by the detailed risk assessment, an implementation plan must be developed. Such a plan should describe how the change will be executed, what specific actions must be carried out, including the risk control options, as well as time limits and responsibilities for addressing any HSQE issue or any negative impact prior to the change being implemented.

11 Approval (Step 4)

If the implementation plan presented in either the Preliminary Impact Assessment or the Detailed Risk Assessment is approved, the change may be executed.

It is strongly recommended that the results of the initial impact analysis be confirmed and validated by the approver. A change whose potential impacts have been poorly analyzed may result in insufficient implementation planning. This will increase risk exposure and the likelihood of significant and detrimental impacts.

In order to adequately perform the technical review, it is critical that the approver be competent in the field or domain where the change is occurring. For instance, in a shipping company, a non-engineering shore-based manager typically has not acquired the necessary competencies to solely provide acceptance for a structural change. Such a change is typically reviewed for approval by an appropriately qualified engineer or naval architect.

If the approver does not concur with the outcome of the assessments and the proposed implementation plan, he or she can reject the change and close out the MoC or ask for the Preliminary or Detailed Assessment to be revisited.

13 Implementation (Step 5)

The implementation step is about executing the change and implementation plan. It also includes updating the documentation to reflect the change, communicating the change, and training personnel on the change.

13.1 Documentation

Management of change requires effective documentation control. Documents from different areas such as drawings, procedures, checklists, permits, emergency response plans, training manuals, software code, signage, etc., may need to be updated to reflect an approved change. A well thought out checklist should be in place to help identify all the management processes that can be impacted by the change. The documentation of such an impacted management process should also be updated if needed (procurement, maintenance, training, mechanical integrity, emergency response, etc.).

Procedures should be updated to reflect the desired modification and utilized as a manner of employee training. When modifying equipment, typical documents revised are process and mechanical procedures, flow diagrams, safe work specifications, inspection methods, maintenance and testing frequencies, etc.

13.3 Communication and Training

Before the change is implemented, all affected personnel should be aware of the change that will take place. The change owner should emphasize consequences of concern and special precautions to be taken as a result of the change.

Change should be communicated to all personnel who may be affected by the change. This notification should occur before the change is implemented. For the case of emergency changes where by nature the change cannot be communicated beforehand, the notification should take place immediately after the execution of the change to advise oncoming shift personnel. For crews that alternate tours of duty, a formal mechanism should exist so that when the crew comes onboard, they are all made aware of the change that took place while they were off duty. The manner and breadth of communication/training should be reflective of the complexity of change (examples are e-mail, anouncements in meetings, tool box talks, safety meetings, full awareness campaigns, formal training, etc.). Relying on passive notifications such as entries in log books or documentation in procedures should not be the sole way of communicating to personnel since they could easily be overlooked by personnel that need to be aware of the change.

Changes involving significant revisions to current practices will require training of relevant personnel. An awareness training, or in some cases, detailed training of the new practice should be provided.

In addition to notifying the people immediately affected by the change, there should be consideration of the need to inform other departments (procurement, maintenance, training, etc.), shore-based organization (HSE manager/ISM designated person regarding the adjustment in operations and/or risk, updating the enterprise wide information system), and external stakeholders (class, regulatory, Flag state, etc.)

Any modifications to documentation or process drawings, updates to risk assessments and reviews, should also be communicated to demonstrate transparency of the MoC process.

13.5 Execution

Before executing the change, the change owner should confirm that all risk control measures from the risk assessments are on target with the implementation plan, and that the affected personnel are trained and informed of the change. Then and only then should the change be put in place.

15 Verification and Closeout (Step 6)

Once any change is implemented, it is good practice to revisit it in the short-term to assess effectiveness.

Companies may find it difficult to finish the update to documentation before the needed change is executed. This verification step will check that the follow-on work was performed prior to closing out the MoC.

Temporary changes should be monitored to confirm that before expiring they are either converted to a permanent change by completing the MoC process or reverted to their original state.

Therefore, some of the questions to be answered during this verification step are as follows:

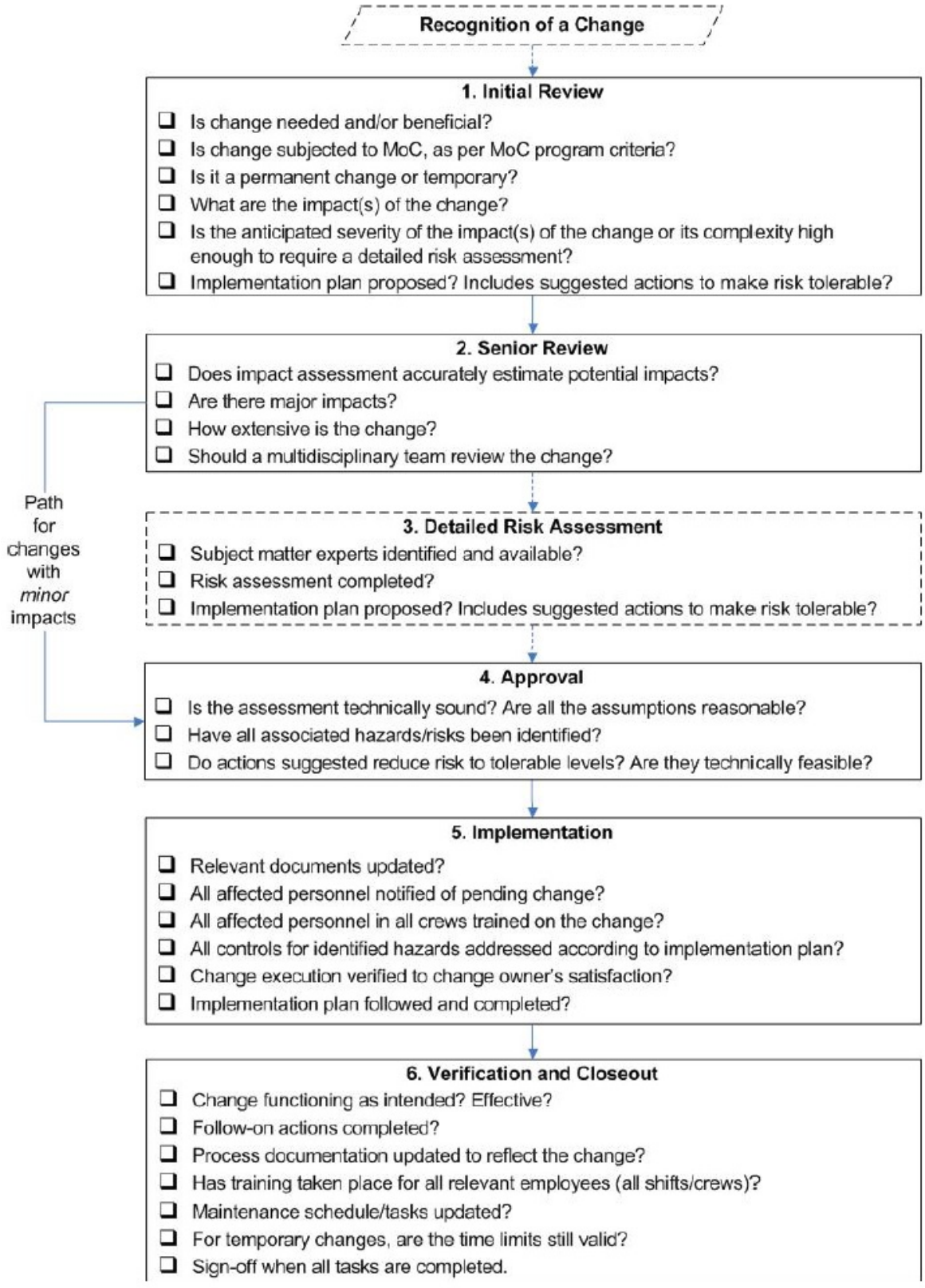
- Are the changes meeting their intended functions?
- Are the actions from the implentation plan being complied with and meeting the intended function?
- Have the temporary changes expired? If so, can the system revert to its original state? If the answer is “no”, proceed to convert to a permanent change, restarting the MoC review process.

15.1 Closeout

All changes that have gone through the MoC review process, even if they were eventually rejected by management, should be signed-off and retained for audit and inspection. This is an essential step to be able to audit the MoC program and monitor the program for continual improvement.

A summary of the typical evaluations carried out in each step of the MoC process is presented in 3/15.1 FIGURE 2.

FIGURE 2
MoC Process Summary



17 Special Circumstances: Temporary and Emergency Changes

It should be identified during the Initial Review if the change falls into the category of temporary or emergency. This distinction is important as the MoC program should offer some flexibility to control changes under these special circumstances.

17.1 Temporary Changes

A temporary change is one that is intended to exist for a short and predetermined period of time. Management of change procedures for temporary changes should follow the same process as a permanent change, but they are only valid for a specific time limit as they may carry a higher level of risk that is acceptable only for a short term.

Temporary changes must have a specified time limit to ensure they are returned to the original system condition or that further steps in managing the change are addressed (i.e., converting the temporary change into a permanent change).

The intent is to make the change, and at some future date, the system will revert to its present or design condition. The time limit for the change should be specified such that if the change does not revert to the original condition, then a permanent change should be implemented. Note that a conversion from a temporary to a permanent change requires that the MoC process be initiated. This new process is intended to highlight improvements to the proposed change, such as new risk control measures that offer a lower risk than the current temporary situation. The new MoC may highlight a situation that, although tolerable for the short term, would be unnaceptable on a permanent basis. Temporary changes normally require less vigorous documentation than permanent changes. Thus, another important reason to re-initiate the MoC process when converting a temporary change to a permanent one is to identify required updates to documents, procedures, training, etc.

Temporary Changes = Temporary Risk Mitigation Actions

A fire alarm sensor in the engine room malfunctions and needs to be deactivated until the required spare is available. A temporary MoC is carried out. As part of the implementation plan, the measures to mitigate the risk include ensuring the engine room remains manned, if operating under UMS. For this temporary change, the engine drawings, design documentation did not require changing, but instead, a revised temporary procedure was implemented to manage the change.

The company should define in the program the maximum length of time permitted for a temporary change (such as six months, or until the next dry dock period, etc.). Some companies offer some leeway in the mandatory time for a temporary change to be converted to a permanent change by providing the ability to extend the time limit for the temporary change by one or two cycles. In either case, a system should be set up to review all temporary changes around the expiration date to verify that:

i) The system was returned to its original condition, or

ii) Conversion was initiated to make the change a permanent part of the system (new MoC required), or

iii) The period for validity of the change was extended.

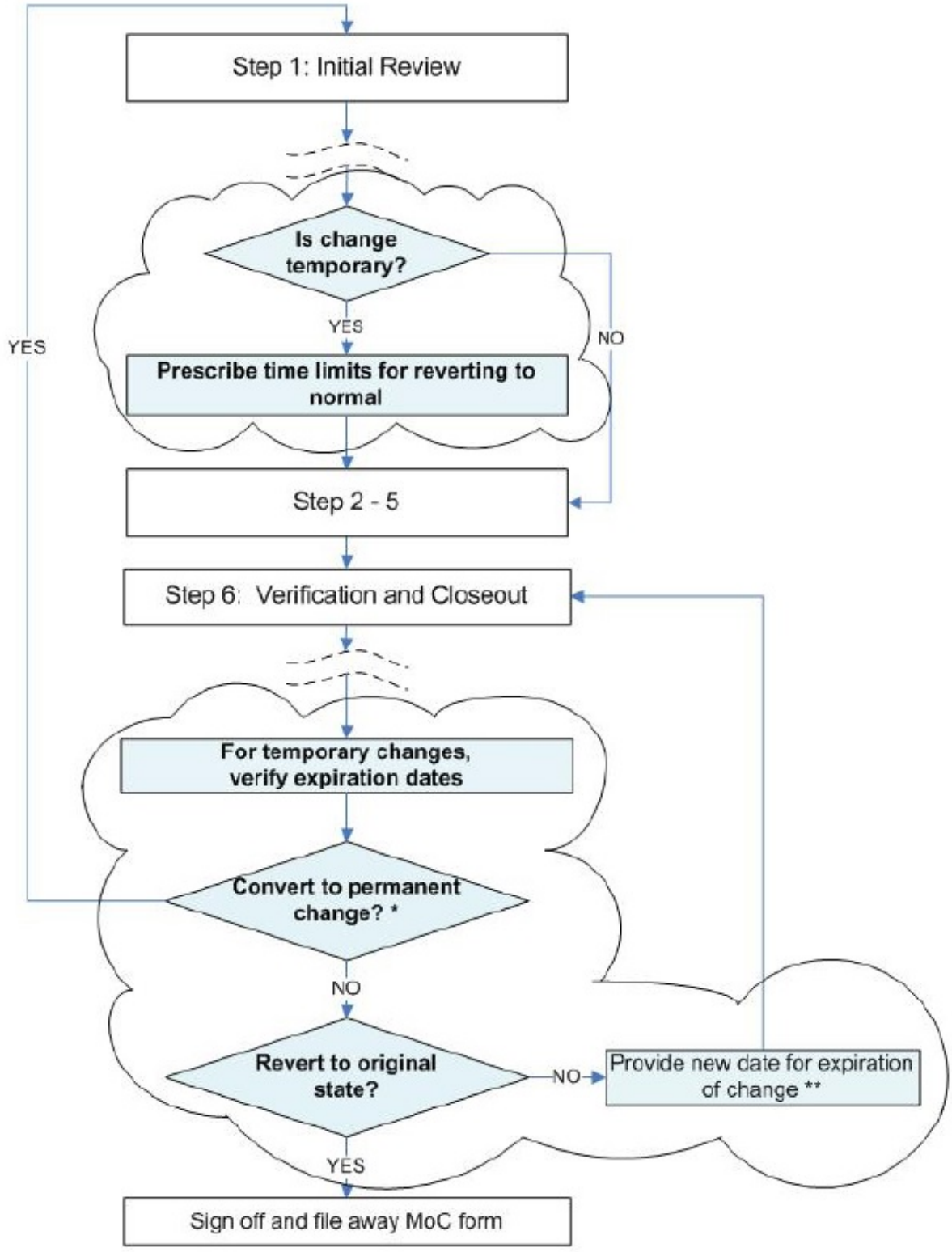
Note that extending the validity of the temporary changes should not be allowed, except for exceptional circumstances. Such an extension requires careful consideration and documentation in the MoC form, which includes as a minimum, re-validating the impact or risk assessment, and proper approvals.

Examples of temporary changes may include:

- Testing/calibration/repair or replacement that requires disabling safety/critical systems
- Installing temporary piping, clamps, connections, utility connections, or hoses:
- Temporary change in routing
- Temporary crew change
- Temporary change of contractors onboard
- Short term use of a new port
- Workaround procedure
- Temporary operation with specific safeguards bypassed or inoperative.
- Temporary de-activation of security features for carrying out maintenance or operation.

3/17.1 FIGURE 3 presents the process to be followed for temporary changes.

FIGURE 3
MoC Process for Temporary Changes



Note:

** A conversion from a temporary to a permanent change requires that the MoC process be re-initiated. In many cases, a higher risk is acceptable for temporary changes. A second pass is intended to highlight improvements to the proposed change, such as new risk control measures that offer a lower risk tha the current temporary situation.*

*** Time extensions on temporary changes should not be allowed except for exceptional circumstances. Any such extension requires careful considerations and documentation in the MoC form.*

17.3 Emergency Changes

An emergency change is a change that must be performed in a true emergency. Generally, the situation is such that action is required quickly, and the persons required to provide approvals may not be available to meet the requirements of the written MoC process. In these "emergency" situations, safety could be jeopardized by waiting for completion of the formal MoC process. In an emergency situation, the change should be reviewed to the best of the staff's abilities. This emergency MoC process should involve a risk assessment using any and all available resources and time to evaluate the risks involved with the change and it may be verbal, rather than written. The focus should be on the immediate risks only. The verbal implementation plan should also be developed and carried out by relevant personnel, with approval from the highest ranking personnel available with domain expertise. The approver for temporary MoCs in a ship should be the Master or the Chief Engineer.

In an offshore facility, the approval of emergency MoCs should fall in the person with ultimate work authority (UWA) at the facility. In the event of an emergency creating an imminent risk or danger, the person with the UWA is has the ultimate authority for safety and decision making at a facility. This procedure to ensure such a high level approval for temporary MoCs will help avoid a cultural trap where team members resort to emergency measures to circumvent the formal MoC process.

At first opportunity after the emergency has been controlled, the change must be fully evaluated and documented using the MoC procedure. The reviews will dictate if the change should be:

- Reversed to continue operations as in the pre-emergency status or
- Converted to a temporary or permanent change.

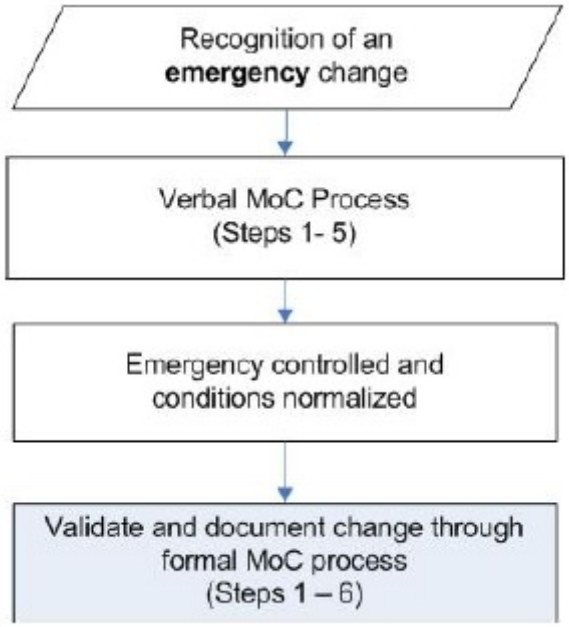
Taking advantage of the time and resources not afforded in the midst of an emergency, the output from the MoC process review can also propose a different change to address the problems that caused or resulted from the emergency.

Situations such as the following may require an emergency MoC:

- Correction of a deficiency that would cause an immediate threat to safety of the ship or offshore facility or personnel/environment
- Imminent environmental release
- Impending external threats that could result in a loss of cargo, such as natural disasters, security threats or extreme temperatures

3/17.3 FIGURE 4 presents the process to be followed for emergency changes.

FIGURE 4
MoC Process for Emergency Changes



1 MOC Program Implementation

An effective MoC program requires preparation beyond defining and documenting a policy to outline the system. The following factors are paramount to successful implementation of the program:

i) Clear roles and responsibilities

ii) Appropriate organizational preparation

iii) A written MoC program manual that includes MoC forms

iv) Pilot roll-out before the full-scale deployment, training of affected personnel, and

v) Close attention when integrating MoC with existing programs.

3 Roles and Responsibilities

The implementation of a management of change program requires actions by many individuals and departments. Specific roles and responsibilities will differ depending on location and circumstance. For example, onboard a large vessel, there may be more than one person assigned to the responsibilities outlined below. However, on a small vessel, one person may be assigned multiple roles and responsibilities within the MoC process. The MoC program procedures should describe the roles and titles for key personnel within the MoC program.

Ultimate responsibility for the proposed change before start-up rests with the individual responsible for the area. but in general, the roles describe below typically support an efficient progran.

3.1 Initiator

The initiator is the person proposing a change or identifying that a change occurred and who works with the change owner to prepare the supporting documentation requested by the MoC program. It can be anybody within the company. If the initiator is an officer level or in a supervisory position in the area where the change is proposed, he or she will also be the change owner and conduct the Initial Review. If the initiator is someone not in a supervisory position, he or she should seek assistance from his or her supervisor for conducting the next step.

The initiator's competencies should include:

- Safe behavior training, with an emphasis both on recognizing the need for changes and latent changes that occur in the system.
- Knowledge of the MoC sytem, with particular emphasis on the types of changes covered, definition of replacement in kind, and how to initiate the MoC process.
- Basic awareness of preliminary impact assessment

3.3 Change Owner

The change owner is a person of supervisor/officer level with responsibility in the area where change is proposed and who works with the initiator in preparing the Initial Review. If the initiator shipboard is an officer or above, then he or she can also prepare the Initial Review as the change owner.

The change owner has ultimate responsibility for the change and, in addition to being in charge of the Initial Review, the change owner will be also be in charge of monitoring the implementation of the change (e.g., coordinating the revision and update of documentation impacted by the change and communicating the change to affected personnel). The responsibility for training may fall on the change owner or on the person who is in charge of training for the organization.

It is a primary responsibility of the change owner to confirm that the change was implemented according to the implementation plan, and subsequently, to verify that it is functioning as intended.

Needed competencies for the change owner should include:

- In depth knowledge of the MoC program
- Well versed in conducting a Preliminary Impact Assessment
- Strong writing skills if he or she may be be responsible for updating procedures and other documentation
- Communication and training skills, if he or she may be responsible for communicating the change to the relevant personnel, or train them on the change

3.5 Approver

An effective MoC program requires a structured approval process that complements the management structure, the complexity of the activities involved, and the levels of competence onboard or at the shore-base. The approver appraises the Initial Review to confirm the need for change and validate the preliminary impact assessment and the implementation plan. If the change has major impacts and it is particularly complex, the approver is strongly suggested to request further detail risk assessment. The program should discourage situations where the change owner and the approver are the same individual to create an unbiased process with adequate reviews and second opinions.

The detailed risk assessment, if deemed necessary, is performed by a team of subject matter experts (individuals with strong competencies in the fields or domains where the change is taking place and impacts are being felt). The approver of the change is normally the same person that determines who are the relevant experts to carry out the risk assessment. The approver also signs off on the risk assessment outputs, including the implementation plan, and designates the personnel to carry out the implementation plan.

In the shipping industry, appropriate approval authority is typically a Senior Officer such as Master, Chief Officer, or Chief Engineer. In some instances, the approval authority may also fall on a shore-based manager with key organizational duties. On an offshore installation, a member of the facility management should approve it.

Needed competencies for the approver are:

- In depth knowledge of the MoC program
- Knowledge of Preliminary Impact Assessment and Detailed Risk Assessment
- Administrative and managerial skills

3.7 Onboard MoC Coordinator

The individual onboard in charge of keeping an up-to-date log of all the MoCs and current status of each change. His/her job is to verify that changes are completed in a timely manner and updated and closed out

as required. The change owner is responsible for the change, but the onboard MoC coordinator has the responsibility to see that all the change owners onboard are on track with their MoCs (Step 6, Verification and Closeout).

The onboard MoC coordinator could also be the one verifying the expiration date of temporary changes and verifies the change owner has indeed finished all of his or her actions in order to close the MoC. For instance, if a temporary MoC is about to expire and it has not been converted to a permanent MoC, it is the responsibility of the onboard MoC coordinator to remind the change owner of the pending actions and get the MoC closed out or converted to a permanent MoC or, in rare cases, get an extension. A program can opt to have the onboard MoC cordinator in charge of closing out the MoC form.

The onboard coordinator competencies should include knowledge of the MoC program and basic adminstrative and managerial skills.

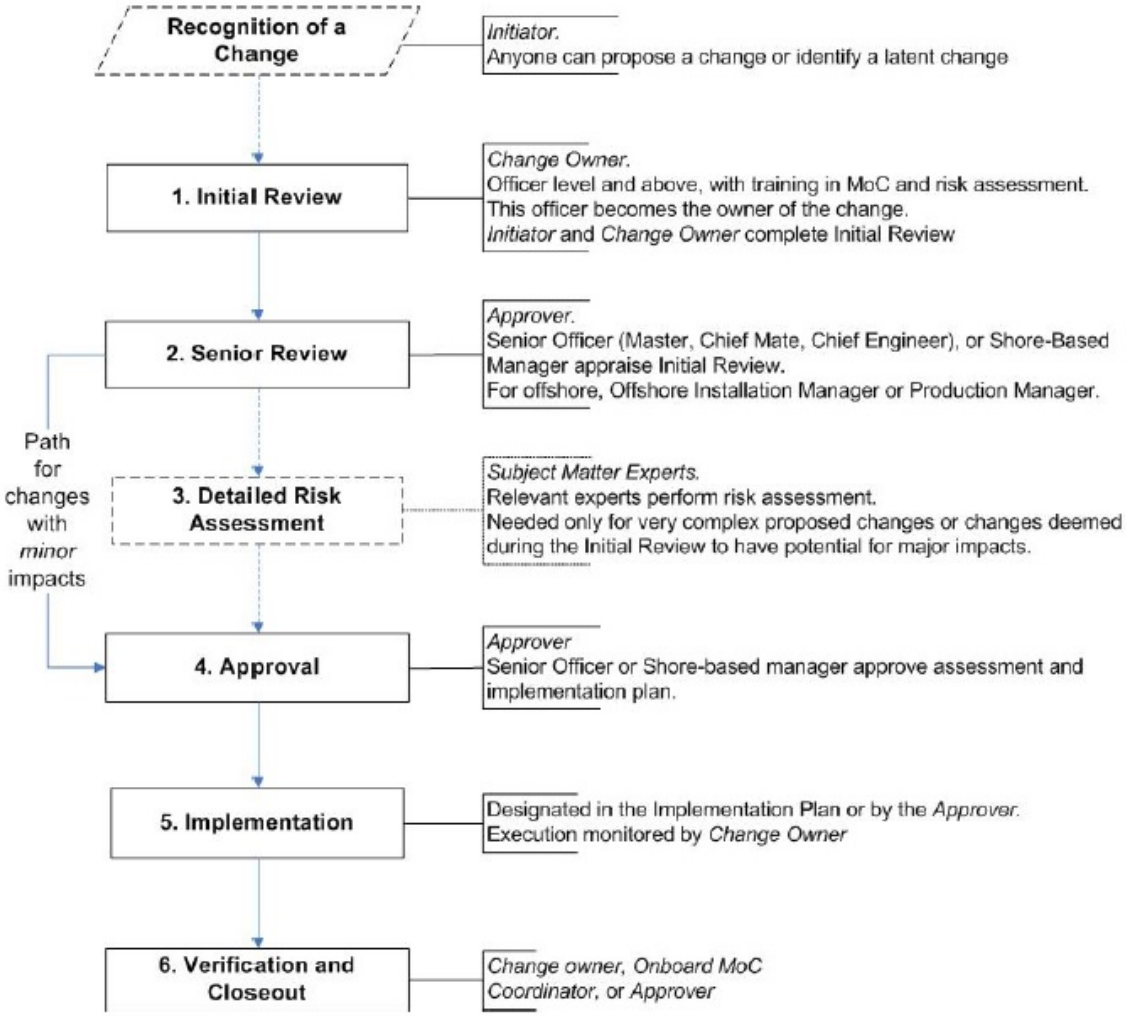
3.9 Shore-based MoC Coordinator and Other Shore-based Support

The shore-based MoC coordinator tracks MoC program performance, including the status of MoCs and MoC actions, and undertakes audits of the MoC program. This role typically falls upon someone with HSQE responsibility. Other departments that will need to be counted on for on-demand support to the MoC program include:

- *Engineering and Operations*. Identify/review equipment and operational changes, participate in preliminary or detailed risk assessments, etc.
- *Safety and Environmental*. Review change against HSE regulations to verify compliance with codes, regulations and company practices.
- *Structural Engineering*. Identify/review structural changes, participate in change risk assessments, etc.
- *Process*. Identify/review changes affecting the topsides and process of offshore process facilities, participate in preliminary or detailed risk assessments, etc.
- *Procurement*. Procure the in-kind replacement requested, identify potential non-in-kind replacements, and provide the change owner with suppliers' specification and other data to aid in the in-kind determination of a replacement, etc.
- *Training*. Support for changes that require more in-depth training than that which the onboard staff can provide
- *Human Resources*. Provide personnel qualification matrices and define lines of reporting, participate in risk assessments for organizational changes.

A summary of the the roles and responsibilities in the MoC process is presented in 4/3.9 FIGURE 1.

FIGURE 1
Roles and Responsibilities in the MoC Process



5 Organizational Preparation

Organizational preparation is integral to successful implementation of management of change. Management should lead the commitment toward execution of MoC. This should be exemplified in the policy and vision of the organization. Management should also allocate the required resources to achieve successful implementation of the program. This commitment should be demonstrated throughout all levels of management, and across various business segments within the organization.

5.1 Culture

The MoC program implementation plan should take into consideration the existing culture of the organization and should assist in creating an environment that encourages commitment to the program. Proactive approaches such as change management can be counterintuitive to companies with low safety culture maturity whose primary goal is to get the job done as quickly and with as little investment in resources as possible.

In order to implement a successful management of change culture, the organization itself may first be required to undergo change. It is not uncommon that tenured employees comfortable with their core responsibilities are less apt to welcome change. Over time, complacency can overshadow the importance

of safety, and unless the importance of safety in the organization is emphasized, opportunities for eliminating unsafe behaviours are not realized. Thus, precluding negative perceptions toward a new initiative focused on management of change is important for successful implementation.

Employees must be educated to understand the benefits of managing change. The value of an MoC program for protecting personnel safety, the integrity of the facility, and the environment must be recognized by employees if implementation is to be successful. The MoC program should not be viewed as a 'paperwork exercise' that negatively impacts an employee's ability to efficiently meet work obligations and tasks. Engaging employees early in the design and development stages of the program will promote buy-in and help to control negative perceptions.

5.3 Management Support

Management commitment is necessary in developing a work environment conducive to the successful implementation of MoC. From the crew's perspective, company concern is inferred when the master, chief engineer, or shore-based manager discusses MoCs with employees on a regular basis. When standard business metrics include MoC and when managers participate in change reviews, the company's commitment is evident. Failure to achieve this important objective may cause MoC to appear as a trend that will not be continuously scrutinized by management.

Often for employees, the actual test regarding the permanency of and commitment to the MoC program occurs when they see management reactions to the MoC process when challenged by competing operational goals. If the requirements of MoC are suspended even temporarily for the benefit of business and economic advantage, the practice of MoC in the minds of the employees is trivialized. Thus, continual engagement and commitment (e.g., asking questions on program performance, rewarding successful program metrics, taking action to improve the efficiency and quality of the program, etc.) make it clear that the MoC program is viewed by management as a standard for conducting business.

5.5 Resources

The level of effort required to manage an MoC program must be clearly estimated at the development stages. There needs to be enough people with capacity to take on MoC preparation, review, analysis, and approval, as well as audit and tracking. For example, all officer-level personnel should be trained in the MoC program, including how to conduct a preliminary impact assessment. Consider documenting the MoC roles as responsibilities within job descriptions and assessing personnel performance matrices during annual appraisals. Reinforce personal accountability for tasks within the MoC program by implementing leading performance metrics such as attendance at MoC review meetings, length of time in approver's hands, number of MoCs closed within the specified time, and number of MoC actions completed (see 5/3 for more on performance metrics).

An MoC process that utilizes onboard personnel for reviews and approvals will be more efficient than one that relies heavily on onshore resources. There will be cases, however, when the collective experience onboard will need to be supplemented by onshore expertise. The fact that shore-based staff may only be available during the shore-base normal working hours may present a problem for proposed changes that necessitate shore-based review or approval, but also a quick turn around. The MoC program should outline clear lines of communication and responsibility to improve access to relevant and experienced personnel.

Resources in the form of documentation and data will also be needed during the review of a proposed change. For example, the Preliminary Impact Analysis and the detailed risk assessment will benefit from up-to-date machinery and process information available to perform the required reviews. This can be a challenge in the marine and offshore industries where information can be distributed between the ship or offshore facility and the shore-base. A solution is to include a shore-based representative with remote access as part of the assessment team. If this cannot be accomplished, then special provisions may be created in the review process for review by a competent person prior to approval when attempting to assess risk.

Historically, MoC teams were composed of operations, engineering, and maintenance personnel. Proactive organizations solicit significant participation from cross-sections of the organization. Procurement professionals can provide enormous support in risk control by reviewing contractor quality, training, and experience standards prior to bid meetings. Information Technology (IT) departments may be required to set up electronic MoC programs (which should be user tested and established before full rollout). Communication or Human Resources departments may be involved in the preparation of training materials and information sharing. Other departments may be responsible for preparing support materials such as spreadsheets and files, or preparing all the other tools and forms necessary to conduct an MoC.

A company wishing to keep track of time spent in the management of change process can implement a specific MoC charge number that personnel can use to accurately record the time spent. This information would be valuable for trending, efficiency analysis and continuous improvement of the program.

7 MoC Program Manual

It is important to document the processes and procedures of the MoC program to establish the rules for the program, educate personnel on the process, and provide consistency in the implementation. This written program should outline the basics of the process. The MoC program should clearly state the manner for updating process documentation. An effective formal document control system will support change management and provide reliable access to current information, preventing the use of superseded versions. A robust documentation system that is simple and not overly cumbersome has a greater chance of being adopted by personnel.

The MoC program documentation should be aligned with that of other management processes to reduce repetition, increase the opportunity for standardization, and ease implementation and compliance with internal and regulatory policies.

Two important tools need to be present for a smooth implementation of the MoC program: the MoC form and the MoC log.

9 MoC Form

The MoC form is essentially the documented record of all evaluations, approvals, and actions associated with a change. The development of the MoC form is essential to allow the necessary information to be gathered and recorded efficiently and effectively. Information typically requested in an MoC form includes, but is not limited to, the following:

- MoC Reference Number (should be same as in the MoC log)
- Date
- Names and department of initiator and change owner
- Description of proposed change, including the reason/technical basis for the change
- Type of change (emergency, temporary, or permanent)
- Preliminary Impact Assessment (may include a checklist to facilitate process)
- Implementation Plan
- Questions or criteria to decide if detailed risk assessment is neeeded
- Approvals
- Prescribed time limits and status reviews for temporary changes
- Documents that need updating (may include a checklist to facilitate identification)
- Change summary communication list
- Training needed

See Appendix A2 for sample MoC form.

11 MoC Log

The log functions like a register or record book of all changes on board. The information contained in the log can show at a glance which MoCs are open, which are about to expire, which are late and where actions need to be taken. This ensures MoCs do not stay open for long periods of time. The MoC log typically contains the following information:

- MoC reference number
- Date
- Department
- Change owner
- Brief description of change
- Type of MoC (temporary, emergency, or permanent)
- Status
- Temporary changes expiration date
- Approver

The log also can play an important function for emergency changes. MoC programs can allow for emergency changes to follow the MoC program in an abbreviated and verbal (i.e., not documented) format until the emergency is controlled, at which point the change should be documented and the standard MoC process followed. The emergency task team shall, as a minimum, obtain an MoC reference number from the log, which will provide the reminder to follow up on the change through the MoC program.

11.1 Handover of MoC Responsibilities

A tour of duty can be measured in terms of days, weeks, or months at a time, and sometimes there is not enough time in a tour of duty to ccomplete all the change activities. This puts a significant strain on an MoC program as the change activities need to continue under a different crew than the crew that initiated the change. The crew turnover procedure should include official handoff of the MoC responsibilities.

For a ship or offshore facility, it makes sense to have one log which collects MoC information for all departments. A new crew coming onboard can take a look at the log and see the status of all MoCs without having to go to each department and pull the MoC files, which could be several sheets with attachments.

The log can be paper-based or it can be electronic (e.g., a spreadsheet).

13 Pilot Roll-Out

Implementing the MoC program on a pilot ship or offshore facility will help achieve a smooth transition throughout the organization. This can be taken as a test run opportunity to identify issues and resolve problems before complete roll-out. The pilot roll-out should be monitored and assessed with results analyzed to provide system improvements. This strategy allows the system to be evaluated to improve the efficiency and effectiveness of the program. Implementation of a program that has not been appropriately analyzed may prove detrimental as users may become frustrated with a difficult system.

The omission of pilot implementation to ease the learning process has burdened some organizations with ineffective systems. Clear and concise instruction and good engagement with crews and employees will assist greatly in the effective implementation of MoC. Even for multiple facilities, it is advisable to begin implementation with a pilot trial focused on communication, training, and encouragement. Ships or offshore facilities selected for pilot programs should be chosen based on the following overall characteristics:

- *Culture* – A ship or offshore facility in which crew is receptive to system improvements with strong management support and direct involvement in safety, and which other employees consider as a leader in safety in the corporation and are an example to others.
- *Need* – A ship or offshore facility that has many changes on a regular basis, or where past experience has resulted in incidents which could have been avoided with an effective MoC program, and employees and management are motivated to remedy the problem.
- *Existing Systems* – A ship or offshore facility that has existing systems that will make the adoption of an MoC program much easier (i.e., an efficient management system which could have an MoC program added to it, existing risk-based systems, or advance hazard review processes will make the MoC program much simpler to implement).

The pilot program will also give management an opportunity to solicit employee feedback to effect program improvements before implementing across the whole organization. This yields greater user acceptance and "buy-in" by having employees present feedback to shape the final design.

15 Training in MoC

Training personnel to understand the principles and procedures of the MoC program is essential to implementing a successful program.

Awareness training is necessary for all personnel affected by the introduction of the MoC program to ensure correct recognition of relevant changes and correct implementation of the system. Specific training will be necessary for personnel expected to originate change requests, conduct preliminary impact assessment, and review and approve changes.

All those who can make a not in-kind change should be familiar with the MoC process and should be capable of filling out the request for change (usually the first part of the MoC form) and should understand what happens to it once filled out. All supervisors need to be familiar with the process and their role in the process. All those who may be involved or who could be asked to review MoCs should also receive training.

Effective training requires good relevant examples of changes to be controlled as well as replacement-in-kind. Examples should show ship/department specific examples of management of change in similar scenarios to those with which personnel are likely to be confronted. Issues that should be addressed in training include:

- Determining if a change is to be controlled by the MoC program
- How to complete the MoC log
- How to complete an MoC form
- Permanent, temporary, and emergency changes
- Preliminary Impact Assessment
- Detailed Risk Assessment
- Approval process
- Documentation, communication, recordkeeping related to MoCs
- Handover of open MoCs at shift/crew change
- Lessons learned from MoCs

Best practice also suggests that refresher training should be implemented to promote continued improvement of the utilization of the system. Training that is well crafted and delivered to meet the needs of an employee results in engagement rather than resistance.

1 MOC Program Monitoring

MoC enforcement in the marine and offshore industries presents a set of unique challenges. Ship captains, for example, are under significant pressure to meet schedules irrespective of weather conditions, and it is easy for changes to happen more quickly than an MoC process would allow. There is also more autonomy in the functioning of a ship or offshore facility and greater isolation from shore-based management. It would be much easier for onboard changes that require MoC to be performed uncontrolled without repercussions and in many cases discovery. The bypass of steps in the MoC program is more difficult onshore given the number of persons present and involved in the process and the level of vigilance by coordinators and supervisors.

The program is implemented for legitimate and important reasons and therefore should be utilized correctly unless extreme situations prohibit it. Compliance with the MoC program can be improved by:

- Communication of the importance of MoC and support from the top of the organization
- Effective adminstration, monitoring, and tracking of the program, and
- Continual improvements to optimize the program

Effective administrative strategies should be in place to operate and maintain the MoC program, starting from accurate and timely completion of MoC forms to the monitoring and continuous improvement of the program

To optimize operation of an MoC program it is important to audit and monitor the system. An MoC program requires clear direction and sufficient resources to run smoothly. One of the resources necessary should be in the guise of the MoC coordinator(s) and the level of administrative support. The role of the MoC coordinator is to monitor the operation of the system, resolve any issues that may arise, and have overall responsibility over the maintenance of the program records and documentation. In the marine and offshore industries, this role usually falls under someone within the shore-based HSQE team. Depending on the needs of the system; it may be that only part-time resources are necessary. However this should be carefully considered in the design and implementation stage. As previously mentioned, a lesson learned from other industries is that under-resourcing this role can lead to abandonment of the whole system.

The MoC coordinator will be responsible for the implementation of the program and making sure changes that go through the program are completed in a timely manner. He or she will check for compatibility and alignment with other management processes and other site procedures. The coordinator will verify compliance with the MoC program through regular audits and reviews. Evaluation and assessment of MoC by the coordinator can highlight improvements required to optimize the system.

The MoC coordinator must carefully monitor any temporary and emergency MoC changes, checking that temporary changes are followed up by the change owner within their given validity dates, and check for abuse on the use of emergency MoCs.

Another function of the MoC coordinator can be to provide assistance to determine the risk associated with a change. Thus, it is important that the MoC coordinator is trained in risk assessments, and is astute for risk identification.

Although most changes will be completed within individual departments, the MoC coordinator can support their efforts by resolving questions and issues that may arise as to the use of the MoC program or disagreements concerning requirements for management of change.

The coordinator should review MoC records for quality and circulate lessons learned and remedial measures implemented to fix problems.

3 Performance Indicators

Program performance indicators and efficiency metrics can aid in system improvements by easily identifying areas of poor MoC performance. These metrics will help determine if sufficient resources are allocated within the program, provide data to monitor the program's ability to prevent incidents, and measure continual improvement over time. Parameters that can be measured to indicate performance and efficiency of an MoC program include the following:

- Number or percentage of modifications that bypass the MoC program
- Percentage of temporary changes that exceeded their validity dates
- Number of changes initially rejected due to incomplete or poorly completed MoC forms
- Percentage of changes that take place before the actual MoC approval step
- Percentage of maintenance work orders that were misclassified as replacement-in-kind rather than changes
- Percentage of changes implemented for which the related documentation was not updated
- Average time period for a change to complete the MoC process
- Average number of manhours spent on a change to complete the MoC process
- Decrease in number of change-related incidents/accidents
- Percentage of personnel that believe the MoC program is effective

5 Recordkeeping

MoC records must meet corporate recordkeeping requirements as a basic minimum. Ideally, MoC records should be kept locally for quick reference and possibly centrally for archival purposes. MoC records should also be kept in a system that distinguishes MoC records by areas/equipment for easy retrieval. MoC records shall also be distinguished by status (i.e., open or closed) to facilitate regular audits that verify the performance of the MoC program. There is greater urgency for the local storage of draft, pending approval, approved, and open changes, as these may be part of day-to-day operations.

The owner of the change maintains responsibility for the change until it is closed out and needs to have easy access to the MoC record. Updates to documentation should be prompt and communicated to relevant personnel immediately so that all personnel involved with the change have access to the most recent and relevant information on which to base decisions. The necessary information that should be gathered and retained for every change would typically include:

- A description of the proposed change
- List of required risk assessment reviews and subsequent recommendations

- Confirmation of approvals for the changes
- Status reviews (for temporary changes)
- Change summary communication list

Some if not all of the items above can be documented within an MoC form (see sample in A2).

Efficient record keeping is essential to successful operation of any MoC program. Records of MoC forms for all changes should be archived for use in monitoring individual changes. Records should be kept according to company recordkeeping retention policy, either in a paper based system or electronically.

Recordkeeping and "sign offs" pose greater challenges onboard if copies of MoC records need to be maintained with the ship or offshore facility as well as onshore management. The shortened duration that ships are in home port limits the opportunity for hand transfers and MoC team meetings. Transfers will often have to be electronic and organizations must take care in preventing revision control from becoming problematic. This is when the use of electronic MoC programs for the cataloguing of change forms with their supporting documentation may be beneficial.

7 Continual Improvement

Continual improvement of the MoC program should be considered when designing the system, but it is also important throughout the operation of the process. Part of the documented procedures should address how the system can be modified effectively to incorporate improvements. Methods of data gathering should be outlined so that all affected by the MoC program have the opportunity and the means by which to offer feedback for improvement.

Part of the improvement process will be to start with a simple paper system and refine the operations and distribution systems. Then areas for improvement will be to optimize the form, add checklists based on information gathered in old forms to clarify further replacement-in-kind and preliminary impact assessment, judgement on minor/major impacts, improve distribution to relevant personnel, improve the assessment/review processes with more structured review approaches, combine sessions to make processes more efficient, look at electronic distribution and archiving of documents, develop key performance indicators (KPIs) and track performance, issue lessons learned, and expand the process to other areas of the business or other locations/ships.

9 Suggested Reading

Additional information regarding managment of change and risk assessment can be found in the following publications:

- API RP 750, Management of Process Hazards, American Petroleum Institute, Washington, DC, 1990.
- API RP 75, Recommended Practice for Development of a Safety and Environmental Management Program for Offshore Operations and Facilities, American Petroleum Institute, Washington, DC, 2004
- Arendt, J. S., Resource Guide for the Process Safety Code of Management Practices. Chemical Manufacturers Association, Inc., Washington, DC, 1990.
- Guidelines for Hazard Evaluation Procedures (Second Edition with Worked Examples), Center for Chemical Process Safety, New York, 1992.
- Guidelines for Management of Change for Process Safety, Center for Chemical Process Safety CCPS (2008).
- Health Safety and Environment Case Guidelines for Mobile Offshore Drilling Units, International Association of Drilling Contractors, Houston, TX, 2010.
- Process Safety Management of Highly Hazardous Chemicals (29 CFR 1910.119), U.S. Occupational Safety and Health Administration, May 1992, available at www.osha.gov.

- Oil and Gas and Sulphur Operations in the Outer Continental Shelf – Safety and Environmental Management Systems, Final Rule (30 CFR Part 250), U.S. Department of the Interior, October 2010, available at www.regulations.gov.
- American Bureau of Shipping. *Guidance Notes on Risk Assessment Applications for the Marine and Offshore Industries.* Houston, TX.

APPENDIX 1

Preliminary Impact Assessment

1 Tools for Preliminary Impact Assessment

There are a number of different ways in which companies may conduct a preliminary impact assessment for managing change. The methods that follow illustrate some options that companies have chosen to perform a preliminary impact assessment. For example, a subjective evaluation of the hazards can be complemented by the use of a checklist, and a risk matrix can be used to effectively rank the risks identified with any identification methodology.

1.1 Hazard Checklist

A checklist of potential hazards can be developed. The change owner can use this checklist to identify the hazards that apply, to determine the potential impacts of each hazard, and to decide whether a change should be considered minor or major. Guidance for thresholds of minor or major impact can be added to the checklist or the subjective judgment of the initiator may be used. It is considered that organizations that utilize the checklist method have made significant advances towards best practice risk management in that they have utilized their staff to adopt an MoC process, assess each change against a checklist of impacts, and make subjective determinations regarding the severity of the impacts. These determinations are also validated by at least one higher-ranking person in the event of a minor impact and possibly several for a major impact. One drawback of the checklist is that users may limit themselves to the hazards listed in the checklist, and not strive to identify any unique impact that is not already listed. Any item checked on the checklist as an impact should be addressed in the implementation plan with action items to reduce or eliminate this impact potential. A sample impact checklist is shown in A1/1.1 TABLE 1.

TABLE 1
Impact Checklis

Organization

Can the change have an impact on:

- □ Management systems
- □ Responsibilities
- □ Work practices
- □ Staff movement
- □ Contractors
- □ Company reputation
- □ Regulatory compliance
- □ Insurance

Environment

Can the change have impacts on:

- □ Effluent – solid
- □ Effluents – liquid
- □ Effluents – gas
- □ Noise
- □ Regulatory compliance
- □ Spills
- □ Marine eco-system

Maintenance and Inspection

Can change have an impact on

- □ Trip and alarm testing
- □ Maintenance procedures
- □ Inspections
- □ Portable equipment
- □ Piping/valve standards
- □ Vessel (container) rating
- □ Relief valves
- □ Pressure isolation
- □ Construction/installation
- □ Pipelines *
- □ Drydocking

Operating Procedures

Can change have an impact on

- □ Operating instructions
- □ Start-up of equipment
- □ Normal operation
- □ Shutdown of equipment
- □ Preparation for maintenance
- □ Abnormal/emergency operations
- □ Commissioning equipment

Crew and Human Factors

Can change have an impact on

- □ Crew workload
- □ Workplace stress
- □ Crew communication
- □ Crew understanding
- □ Crew morale
- □ Crew performance
- □ Ergonomics

Processes

Can the change have an impact on:

- □ Temperature
- □ Pressure
- □ Flow
- □ Level
- □ Material composition
- □ Reaction conditions
- □ Flammability
- □ Services/Utilities

Safety and Health

Can change have an impact on

- □ Personal safety
- □ Fire fighting
- □ Means of escape
- □ Fire protection
- □ Fire detection
- □ Life saving equipment
- □ Emergency procedures
- □ Local exhaust ventilation
- □ Mechanical isolation
- □ Electrical isolation
- □ Instrument isolation
- □ Fire protection of cables
- □ Earthing and bonding
- □ Area classification

Instrumentation and Hardware

Can change have an impact on

- □ Alarm panels
- □ Electrical systems
- □ Lifting equipment/procedures
- □ Design pressure
- □ Design temperatures
- □ Materials of construction
- □ Relief rate
- □ Vessels
- □ Vents
- □ Pipework/supports/bellows
- □ Valves/relief valves/bursting disc
- □ Orifices
- □ Filters
- □ Instrumentation
- □ Corrosion/erosion
- □ Vibration
- □ Spares

Work Environment

Can change have an impact on

- □ Working conditions
- □ PPE
- □ Work surfaces
- □ Housekeeping
- □ Types of tools

Electronic Systems

Can change have an impact on

- □ Software
- □ Data
- □ Computer hardware

Structural

Can change have an impact on

- □ Structure
- □ Stability
- □ Pipelines
- □ Port facilities

General Arrangement/Access

Can change have an impact on

- □ General arrangement
- □ Emergency access
- □ Maintenance access
- □ Lighting
- □ Alarms
- □ Handrails/ladders
- □ Platforms/walkways
- □ Vehicles
- □ Fire fighting
- □ Facility/Ship access

Offshore Operations

Can change have an impact on

- □ Drilling
- □ Diving
- □ Helicopter
- □ Towing
- □ Crane operations
- □ Production
- □ Offloading
- □ Anchoring

Ship Operations

Can change have an impact on

- □ Navigation
- □ Recovery from blackout
- □ Cargo operations
- □ Ballasting operations
- □ Berthing
- □ Anchoring
- □ In-port
- □ Station keeping
- □ Propulsion
- □ Manuevering
- □ Communications
- □ Towing
- □ Crane Operations

Security

Can change have an impact on

- □ Security/Security systems

1.3 Hazard Identification

Hazard identification is a simple technique involving a team of at least two people led through a brainstorming exercise to systematically identify hazards. As it applies to MoC, the exercise goal is to look for possible risk impacts associated with a proposed change and identify appropriate risk management strategies. A hazard identification exercise needs a team of at least two people with knowledge and experience in the area where the change will be taking place. The knowledge and experience of the people participating in the hazard identification exercise affect their ability to recognize and evaluate the potential hazards and impacts of the change, and propose effective risk control measures.

A procedure for performing a hazard identification exercise for evaluating changes is described in the following steps. The hazard identification is typically recorded in a tabulated format with qualitative descriptions.

- Step 1 Define the change, including the system or activity it is associated with.
- Step 2 Identify the differences, even subtle ones, between the existing situation and proposed change.
- Step 3 Evaluate the possible effects of notable differences.
- Step 4 Generate recommendations to better control significant impacts associated with the change.
- Step 5 Use a risk matrix to characterize risk impacts of the change

A1/1.3 TABLE 2 shows an example of a hazard identification review.

TABLE 2
Sample Hazard Identification for Installation of a Lifting Appliance on Deck for Hose Handling on an Oil Tanker

#	Differences/ Impacted Areas	Hazards (during installation & operation)	Detailed Description of Impacts (Consequences)	Existing Risk Control Measures	Risk Consequence/ Likelihood	Recommendations	Residual Risk Consequence/ Likelihood
1	Cargo Operations	Impacts while operating lifting appliance.	Potential for injuries if personnel are hit by moving parts of the appliance, or dropped objects.	None	Medium Risk Significant/Occasional	Note in procedures and place cautionary signs in the radius of impact.	Low Risk Significant/Seldom
2	Emergency Access	Appliance blocking the escape ways.	Potential for the appliance to hinder emergency access.	Appliance size is 2 m H × 0.5 m D × 1 m W and not located near emergency access.	Low risk Serious/Unlikely	No additional recommendations.	
3	Structure	Inadequate understructure support.	Potential for cracks on main deck, above cargo tanks. Potential for oil to leak out, or air entering the inert gas space of the cargo tank. Explosive atmosphere in cargo tank.	None	High Risk Serious/Frequent	Provide reinforcement for the under-deck structure to support the weight of the new lifting appliance.	Low Risk Serious/Unlikely
4	…						
5	…						

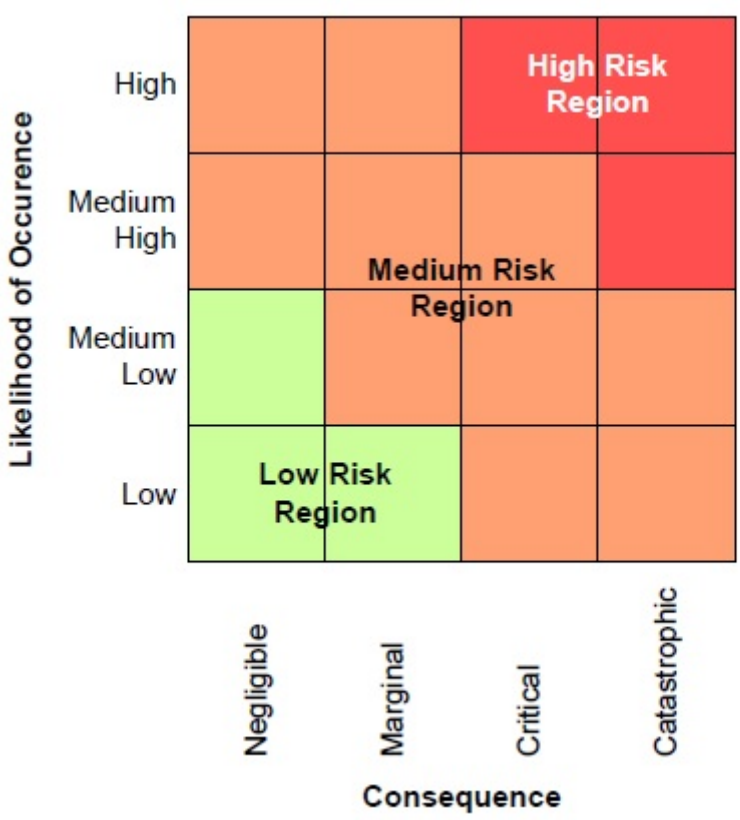
1.5 Risk Matrices

Risk matrices can be utilized to help assess the risks (likelihood and consequences) of a change once the impacts have been identified. The combination of consequences and likelihood of an event occurring can be categorized. The organization must pre-define these categories and should have a method for prioritizing and dealing with the outcomes. Each organization can determine the range of acceptable and unacceptable risks. An organization can preemptively select criteria relevant to its own business model to assist in determining the change impact. For instance, any change with a potential impact to cause multiple fatalities or long-term impact to the environment may be considered a change with major impact, and one that requires detailed risk assessment. These criteria can be extended to other important business parameters such as any impact to schedule or any impact with a cost above a threshold value (e.g., $1 million).

If the change is simple and impacts are deemed to be minor, there is no need for further assessment. This provision will make the system more efficient and place emphasis where it is most needed.

The sample risk matrix in A1/1.5 FIGURE 1 has three distinctive risk regions: High, Medium and Low. These regions should be tied to predetermined criteria. The criteria can be tied to action items and/or to decisions on whether or not to request further risk analysis. For example, impact(s) of changes that fall in the High Risk Region of the matrix (high likelihood and high consequence), should require a Detailed Risk Assessment be carried out. On the other extreme of the risk matrix, if the impact is assessed to be in the Low Risk Region of the matrix (low consequence and low likelihood), there is no need for a detailed assessment. When a change has at least one impact in the Medium Risk Region of the matrix (medium risk), the initial and senior reviewers use their discretion as to whether or not a more detailed risk analysis is required.

FIGURE 1
Sample Risk Matrix



1.7 Positive Impacts

A change is usually proposed because it is perceived as beneficial. The change may optimize an operation, reduce costs, improve safety, etc. During the preliminary impact assessment, beneficial impacts are likely to come to light, along with the negative impacts associated with the change. However, the ultimate goal of an impact or risk assessment is to identify the detrimental impacts of a change so they can be properly mitigated. The best place to record beneficial impacts is not in the risk assessment part of the MoC form, but on the section where reason and justification for the change is given.

1.9 Job Safety Analysis vs. MoC

Proactive companies use job safety analysis (JSA) as a technique to eliminate or reduce the occurrence of undesirable incidents during work tasks. The goal of a JSA is to assess the hazards associated with a task and the means by which they can be eliminated or reduced to an acceptable level. The difference between the hazard identification done for purposes of the JSA and one done with the purpose of MoC is their focus. JSA are primarily used for controlling hazards to the safety and health of the workers, thus reducing occupational accidents to the **personnel while executing the task**. The MoC assessments focus on the potential impacts of the change **to the whole system and throughout the life-cycle of the change,** from installation to decommission.

An example would be the installation of a new lifting appliance on a deck structure of an oil tanker. The JSA for the task of installing the appliance will identify problems such as potential injuries from personnel slipping and falling due to spilled hydraulic oil. The action item to control this hazard would be to keep handy rags or absorbent material to clean up any spills resulting from connecting to the hydraulic system.

The MoC analysis for installing a lifting appliance will identify hazards and impacts to the system, both during the installation as well as in-service (i.e., what impacts to the system/enterprise may result from operating with the lifting appliance). One such impact is the effect of the weight of the appliance on the under-structure. Over time, the under-structure support, if not designed to support the lifting appliance, can result in cracks on the main deck above the cargo tanks. There is potential for oil to leak out, or air to enter the inert gas space of the cargo tank resulting in an explosive atmosphere in the cargo tank. The action item to mitigate this impact is to provide reinforcement for the underdeck structure to support the weight of the new lifting appliance.

A company having both a JSA and MoC should use the JSA for the work tasks needed to execute a change, but the JSA should not be the only mechanism for identifying the hazards associated with the change. As their focuses are different, the JSA and the MoC analyses are not interchangeable, but complimentary. The hazard identification carried out as part of the MoC process is more comprehensive than the typical JSA as it focuses on the potential impacts of the change to the whole enterprise and throughout the life-cycle of the change from installation to decommissioning, as summarized in A1/1.9 TABLE 3.

TABLE 3
Focus of Hazard Identification for JSA and for MoC

Focus	*JSA (typical)*	*MOC*
Identify and control impacts to:	Personnel (occupational safety)	Enterprise (safety and health, property, environment, reliability, efficiency, quality, etc.)
Identify and control impacts that occur during:	Job tasks (physical execution of the change)	Change complete lifecycle of the change (cradle to grave)

APPENDIX 2

Two Completed MoC Examples

Example 1: Addition of Lifting Appliance on Deck of an Oil Tanker

I-A Request for Change

MoC Tracking No: 12-081	**Vessel:** Mucky Duck (Oil Tanker)	**Initiation Date:** 15 Nov 12
Modification Title: Addition of Lifting Appliance on Deck		**Required Implement. Date:** 30 Nov 12
Change Initiator: Rick Superintendent	**Position/Department:** Repair Superintendent (shore-based)	
Change Owner: Alan M. Mate	**Position/Department:** First Mate	

Description of proposed change (Give written details of change)

Add a new lifting appliance to the hydraulic system on main deck in vicinity of cargo manifold.

Drawing, Sketch or Spec attached: Yes ☒ No ☐

Reason and justification for change (e.g., safety/quality/environmental/cost)

This new appliance will aid in handling of cargo hose for loading/offloading cargo. It will speed up the hose connection operation and reduce potential injuries due to manual handling

Type of Change (tick one box)		If change is temporary, please specify time limit, but not to exceed 6 months: *Day/Month/Year*
Permanent	☒	___/_____/___
Temporary	☐	If drydock is necessary for permanent repairs, time limit should be until the next drydock.
Emergency	☐	

I-B Preliminary Impact Assessment

Impacts Checklist. Check all that apply.

Organization

Can the change have an impact on:

- ☐ Management systems
- ☐ Responsibilities
- ☐ Work practices
- ☐ Staff movement
- ☐ Contractors
- ☐ Company reputation
- ☐ Regulatory compliance
- ☐ Insurance

Environment

Can the change have an impact on:

- ☐ Effluents – solid
- ☐ Effluents – liquid
- ☐ Effluents – gas
- ☐ Noise
- ☐ Regulatory compliance
- ☒ Accidental spills
- ☐ Marine eco-system

Safety and Health

Can the change have an impact on:

- ☒ Personal Safety
- ☐ Fire detection/protection/fighting
- ☐ Means of escape
- ☐ Life saving equipment
- ☐ Emergency procedures
- ☐ Local exhaust ventilation
- ☐ Mechanical isolation
- ☒ Electrical isolation
- ☐ Instrument isolation
- ☐ Fire protection of cables
- ☒ Earthing and bonding
- ☐ Area classification

Work Environment

Can the change have an impact on:

- ☒ Working conditions
- ☐ PPE
- ☐ Work surfaces
- ☐ Housekeeping
- ☐ Types of tools

General Arrangement/Access

Can the change have an impact on:

- ☒ General arrangement
- ☒ Emergency access
- ☒ Maintenance access
- ☐ Lighting
- ☐ Alarms
- ☐ Handrails/ladders
- ☒ Platforms/walkways
- ☐ Vehicles
- ☐ Fire fighting
- ☐ Facility/Ship access

Crew and Human Factors

Can the change have an impact on:

- ☐ Crew workload
- ☐ Workplace stress
- ☐ Crew communication
- ☐ Crew understanding
- ☐ Crew morale
- ☒ Crew performance
- ☒ Ergonomics

Ship Systems and Operations

Can the change have an impact on:

- ☐ Navigation
- ☐ Recovery from blackout
- ☒ Cargo operations
- ☐ Ballasting operations
- ☐ Berthing
- ☒ Anchoring
- ☒ In-port
- ☐ Station keeping
- ☐ Propulsion
- ☐ Maneuvering
- ☐ Communications
- ☐ Towing
- ☒ Crane operations

Offshore Systems and Operations

Can the change have an impact on:

- ☐ Drilling
- ☐ Diving
- ☐ Helicopter
- ☐ Towing
- ☐ Crane operations
- ☐ Production
- ☐ Offloading
- ☐ Anchoring

Auxiliary Systems

Can the change have an impact on:

- ☐ Services/Utilities
- ☐ Auxiliary Systems
- ☐ Security Systems
- ☐ Redundant/Backup systems
- ☐ Software
- ☐ Electronic data
- ☐ Computer hardware

Processes

Can the change have an impact on:

- ☐ Temperature
- ☐ Pressure
- ☐ Flow
- ☐ Level
- ☐ Material composition
- ☐ Reaction conditions
- ☐ Flammability

Equipment and Instrumentation

Can the change have an impact on:

Hydraulic System *(list system)*

- ☐ Alarm panels
- ☒ Electrical systems
- ☒ Lifting equipment
- ☒ Design pressure
- ☐ Design temperatures
- ☐ Materials of construction
- ☐ Relief rate
- ☐ Vessels
- ☐ Vents
- ☐ Pipework/supports
- ☐ Piping/pumps/other equipment
- ☐ Valves/relief devices
- ☐ Filters
- ☐ Instrumentation
- ☐ Corrosion/erosion
- ☐ Vibration
- ☐ Spares

Structural/Mechanical Integrity

Can the change have an impact on:

- ☒ Structure
- ☐ Stability
- ☐ Pipelines
- ☐ Port facilities

Maintenance and Inspection

Can the change have an impact on:

- ☐ Trip and alarm testing
- ☐ Maintenance procedures
- ☐ Inspections
- ☐ Portable equipment
- ☒ Piping/valve standards
- ☐ Vessel (container) rating
- ☐ Relief valves
- ☐ Pressure isolation
- ☒ Construction/installation
- ☐ Pipelines
- ☐ Drydocking

Operating Procedures

Can the change have an impact on:

- ☒ Operating instructions
- ☒ Start-up of equipment
- ☒ Normal operation
- ☒ Shutdown of equipment
- ☐ Preparation for maintenance
- ☐ Abnormal/emergency operation
- ☐ Commissioning equipment

Explain the possible way(s) in which the checked impact(s) from the Impacts Checklist can be realized. Describe existing risk control measures for each, as well as any recommendations to reduce risk. Use the Risk Matrix in Annex A to aid in assigning a consequence and likelihood ranking for the potential impact.

Preliminary Impact Assessment

Name: John Superintendent **Position/Department:** Repair Superintendent (shore-based)

Name: Alan Mate **Position/Department:** First Mate (Mucky Duck)

#	Impacted Aspects	Hazards (during installation & operation)	Detailed Description of Impacts (Consequences)	Existing Risk Control Measures	Risk Consequence/ Likelihood	Recommendations	Residual Risk Consequence/ Likelihood
1	Design pressure Electrical systems Utilities	Undersized hydraulic pumps and motors for this new equipment.	Lifting appliance or other equipment that is served by hydraulic system may not be able to function at full capability. Delays in vessel arrival and departure. Financial penalties.	n/a	TBD Significant/TBD	Design review of hydraulic system design capacity.	TBD
2	In-port Anchoring Cargo Operations	Cutting into piping to install appliance connection.	Potential for debris to enter the hydraulic system. Potential to damage downstream equipment (mooring winches and anchor windlasses) with debris and render it inoperable. Inability to conduct mooring operations on that side of the ship.	The filters in the hydraulic system are upstream of line offering poor protection from installation debris. Redundancy of anchoring/mooring equipment.	Medium Risk Significant/ Occasional	Purchase and install a temporary strainer immediately downstream of the lifting appliance to catch installation debris. This will be replaced with spool piece when system has been positively identified as debris-free via hydraulic oil samples.	Low Risk Minor/Unlikely
3	Spills	Leaks of hydraulic oil from improper installation.	Slipping hazard. Contact with hydraulic oil may be a mild health issue. Potential for hydraulic oil to the water/pollution. Potential for $ fines.	n/a	Medium Risk Significant/ Occasional	Pressure testing followed by visual examinations.	Low Risk Significant/Seldom
4	Construction/ Installation Earthing/ bonding	Crew may not have the right knowledge for installing the equipment.	See leaks/spills.	n/a	Medium Risk Significant/ Occasional	Assess capability of crew and officers at installing hydraulic systems. If needed, use riding crew or outside contractors.	Low Risk Significant/Seldom

#	Impacted Aspects	Hazards (during installation & operation)	Detailed Description of Impacts (Consequences)	Existing Risk Control Measures	Risk Consequence/ Likelihood	Recommendations	Residual Risk Consequence/ Likelihood
5	Emergency Access	Appliance blocking the escape ways.	Potential for the appliance to hinder emergency access.	Appliance size is 2 m H × 0.5 m D × 1 m W, away from emergency access.	Low Risk Serious/Unlikely	No additional recommendations.	
6	Structure	Inadequate understructure support	Potential for cracks on main deck, above cargo tanks. Potential for oil to leak out, or air to enter the inert gas space of the cargo tank. Explosive atmosphere in cargo tank.	Inert gas system	High Risk Serious/Frequent.	Provide reinforcement for the under-deck structure to support the weight of the new lifting appliance.	Low Risk Serious/Unlikely
7	Personnel Safety	Impacts while operating lifting appliance	Potential for injuries if personnel are hit by moving parts of the appliance, or dropped objects	None	Medium Risk Significant/ Occasional	Note in procedures and place cautionary signs in the radius of impact	Low Risk Significant/Seldom

I-C Implementation Plan Summary

Summarize actions from the preliminary impact assessment and the risk assessment, if one was done. Include any additional actions needed for the execution of the change.

I-C Implementation Plan Summary

Summarize actions from the preliminary impact assessment and the risk assessment, if one was done. Include any additional actions needed for the execution of the change.

No.	Action Items	Responsible	Due Date
1	Design review of hydraulic system design capacity.	Repair superintendent	20 Nov 2012
2	The necessary reinforcement of structure to support the weight of the lifting appliance cannot be done while the ship is trading. Reinforcement to be performed next shipyard visit scheduled for December 28, 2012. Target installation of the lifting appliance for 1Q2013	Repair superintendent	Dec 2012
3	Assess the capability of crew and officers installing the hydraulic systems. If needed, recommend using a riding crew or outside contractors.	Master	20 Nov 2012
4	As part of installation, conduct pressure testing of the hydraulic system, followed by visual examinations to look for any potential leaks.	Repair superintendent	During lifting appliance installation.
5	Install a temporary strainer/filter immediately downstream of the lifting appliance to catch installation debris.	Repair superintendent	During lifting appliance installation
6	Sample the hydraulic oil within two weeks of installation of the lifting appliance	Engine room	Two weeks after installation
7	Replace temporary strainer with a spool piece when the system has been positively identified as debris-free via the samples above.	Engine room	Two weeks after installation

II Senior Review

Senior Reviewer (Approver)*: Rick Master **Position/Department:** Master (Mucky Duck) **Date:** 17 Nov 12

*Senior Reviewer and Change Owner cannot be same person.

Is there any major impact(s) falling in the High Risk (RED) portion of the risk matrix that cannot be further mitigated?	Yes ☐ No ☒	Do you consider this change to be complex	Yes ☐ No ☒

Further Study

☐ If the answer to any of the above is YES, recommend this change should be investigated further. Conduct a detailed risk assessment and re-submit the MoC (Part III). Specify subject-matter experts that should participate in the detailed risk assessment: .....

.....

Reject

☐ Reject the change. Explain reasons. .....

.....

Approve

Skip III. Continue to IV.

III Detailed Risk Assessment Review

Attach copies of Detailed Risk Assessment, if one was performed. Amend Implementation Plan as necessary.

Detailed Risk Assessment Contributors

Name: ..... Position/Department: ..... Date: .....

Name: ..... Position/Department: ..... Date: .....

Name: ..... Position/Department: ..... Date: .....

Name: ..... Position/Department: ..... Date: .....

Not Applicable

IV Approval

I am satisfied that the change is justified, it has been adequately designed, its impacts adequately considered and the necessary actions planned.	
☒	Proceed with implementation of the change.
☐	Proceed with implementation of the change with the modifications to the Implementation Plan as explained below.
Explanation and modifications to Implementation Plan:	

Signed (Approver*) Capt. Rick Master **Date** November 20, 2012

**Approver and Change Owner cannot be the same person.*

V Documentation and Training

List documents requiring updating, or new documents required.

Type of Documentation	List Documents	Responsible	Target Date	Date Completed	Verified by
Drawings					
Piping	Hydraulic system	Repair Supt	1Q2013	26 Jan 13	AMM
Electrical	One line diagram	Repair Supt	1Q2013	26 Jan 13	AMM
Equipment	Crane Drawings	Repair Supt	1Q2013	26 Jan 13	AMM
Layout	General Deck layout	Repair Supt	1Q2013	26 Jan 13	AMM
Spare parts list					AMM
Operating limits	Crane loading chart, hydraulic/electrical limits for crane	Repair Supt	1Q2013	13 Jan 13	AMM
Std Operating Procedures	Crane handbook, hose connection procedure	Repair Supt	1Q2013	13 Jan 13	AMM
Startup/SD/Emergency	Crane handbook	Repair Supt	1Q2013	13 Jan 13	AMM
Maint. procedures/ schedule	Crane handbook	Repair Supt	1Q2013	13 Jan 13	AMM
Emergency response procedure					
Other admin. procedures					
Other					

Identify any training needs

Area	List Training Required	Responsible	Target Date	Date Completed	Initials
Deck:	Crane Operations	First Mate	TBD	31 Jan 2013	AMM
E/R:	Maintenance & repair	Chief Engineer	TBD	31 Jan 2013	AMM
Others:	.....	.....	.....	.....	.....

VI Verification and Closeout

Verification

Lifting appliance is working as intended in the Implementation Plan.
Sampling indicated the hydraulic oil system is free of installation debris.
Temporary filter has been removed and a spool piece installed

Signed: Alan M. Mate **Position:** First Mate **Date:** Feb 13, 2013

Temporary Change

This Temporary change has been reverted to normal condition/ converted to permanent MoC

Permanent MoC reference .....

Signed (*Initiator*) ..... Date .....

Signed (*Approver*) ..... Date .....

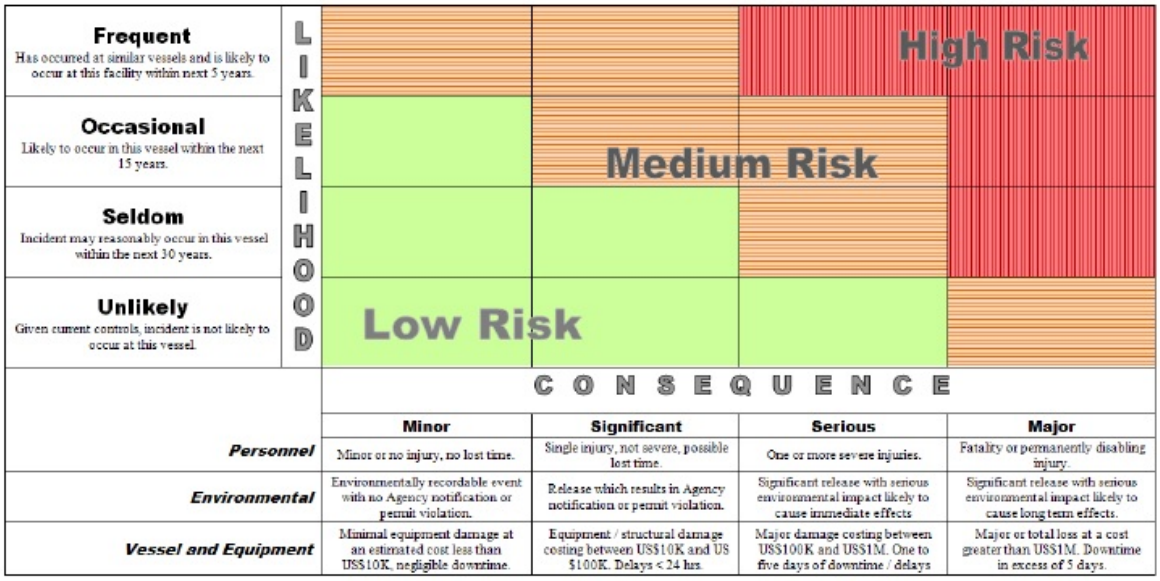
MoC Closed Out

I am satisfied that the change and the post change actions have been completed

Signed: Alan M. Mate **Title:** First Mate **Date:** Feb 13, 2013

Annex A Risk Matrix

Use the attached risk matrix and action criteria for prioritizing the actions generated during the Preliminary Impact Assessment and the Detailed Risk Assessment (if one is conducted).



Action Criteria

Risk	Preliminary Impact Assessment	Detailed Impact Assessment
Low	No need for Detailed Risk Assessment. Implement suggested risk control actions	Recommend implementation of suggested risk control actions.
Medium	Detailed risk assessment to be conducted, if deemed necessary by relevant personnel.	Suggested risk control actions must be implemented.
High	Detailed risk assessment shall be carried out.	Control actions must be implemented to reduce risk to MEDIUM or LOW

Example 2: Addition of Electrical Receptacle in Deckhouse Next to Accommodation

I-A Request for Change

MoC Tracking No: 12-082

Vessel: Offshore 500 (Offshore Facility)

Initiation Date: 2 Mar 10

Modification Title:
Addition of electrical receptacle in deckhouse

Required Implement. Date:
30 Mar 10

Change Initiator:
Harry E. Electrical

Position/Department:
Electrician/Engineering Department

Change Owner:
Joe Engineer

Position/Department:
First Assistant Engineer

Description of proposed change (Give written details of change) Addition of electrical receptacle in deckhouse adjacent to accommodation space, tapping up from an existing electrical circuit (115 V) from the accommodation. Drawing, Sketch or Spec attached: Yes ☒ No ☐ **Reason and justification for change** (e.g., safety/quality/environmental/cost) There is an inadequate number of electrical receptacles in the deckhouse to operate handheld tools.

Type of Change (tick one box) Permanent ☒ Temporary ☐ Emergency ☐	If change is temporary, please specify time limit, but not to exceed 6 months: *Day/Month/Year* ___/_____/___ If drydock is necessary for permanent repairs, time limit should be until the next drydock.

I-B Preliminary Impact Assessment

Impacts Checklist. Check all that apply.

Organization

Can the change have an impact on:

- ☐ Management systems
- ☐ Responsibilities
- ☐ Work practices
- ☐ Staff movement
- ☐ Contractors
- ☐ Company reputation
- ☐ Regulatory compliance
- ☐ Insurance

Environment

Can the change have an impact on:

- ☐ Effluents – solid
- ☐ Effluents – liquid
- ☐ Effluents – gas
- ☐ Noise
- ☐ Regulatory compliance
- ☐ Accidental spills
- ☐ Marine eco-system

Safety and Health

Can the change have an impact on:

- ☐ Personal Safety
- ☐ Fire detection/protection/fighting
- ☐ Means of escape
- ☐ Life saving equipment
- ☐ Emergency procedures
- ☐ Local exhaust ventilation
- ☐ Mechanical isolation
- ☒ Electrical isolation
- ☐ Instrument isolation
- ☒ Fire protection of cables
- ☐ Earthing and bonding
- ☒ Area classification

Work Environment

Can the change have an impact on:

- ☒ Working conditions
- ☐ PPE
- ☐ Work surfaces
- ☐ Housekeeping
- ☐ Types of tools

General Arrangement/Access

Can the change have an impact on:

- ☒ General arrangement
- ☐ Emergency access
- ☐ Maintenance access
- ☐ Lighting
- ☐ Alarms
- ☐ Handrails/ladders
- ☐ Platforms/walkways
- ☐ Vehicles
- ☐ Fire fighting
- ☐ Facility/Ship access

Crew and Human Factors

Can the change have an impact on:

- ☐ Crew workload
- ☐ Workplace stress
- ☐ Crew communication
- ☐ Crew understanding
- ☐ Crew morale
- ☐ Crew performance
- ☐ Ergonomics

Ship Systems and Operations

Can the change have an impact on:

- ☐ Navigation
- ☐ Recovery from blackout
- ☐ Cargo operations
- ☐ Ballasting operations
- ☐ Berthing
- ☐ Anchoring
- ☐ In-port
- ☐ Station keeping
- ☐ Propulsion
- ☐ Maneuvering
- ☐ Communications
- ☐ Towing
- ☐ Crane operations

Offshore Systems and Operations

Can the change have an impact on:

- ☐ Drilling
- ☐ Diving
- ☐ Helicopter
- ☐ Towing
- ☐ Crane operations
- ☐ Production
- ☐ Offloading
- ☐ Anchoring

Auxiliary Systems

Can the change have an impact on:

- ☐ Services/Utilities
- ☐ Auxiliary Systems
- ☐ Security Systems
- ☐ Redundant/Backup systems
- ☐ Software
- ☐ Electronic data
- ☐ Computer hardware

Processes

Can the change have an impact on:

- ☐ Temperature
- ☐ Pressure
- ☐ Flow
- ☐ Level
- ☐ Material composition
- ☐ Reaction conditions
- ☐ Flammability

Equipment and Instrumentation

Can the change have an impact on:

Electrical System *(list system)*

- ☐ Alarm panels
- ☒ Electrical systems
- ☐ Lifting equipment
- ☐ Design pressure
- ☐ Design temperatures
- ☐ Materials of construction
- ☐ Relief rate
- ☐ Vessels
- ☐ Vents
- ☐ Pipework/supports
- ☐ Piping/pumps/other equipment
- ☐ Valves/relief devices
- ☐ Filters
- ☐ Instrumentation
- ☐ Corrosion/erosion
- ☐ Vibration
- ☐ Spares

Structural/Mechanical Integrity

Can the change have an impact on:

- ☐ Structure
- ☐ Stability
- ☐ Pipelines
- ☐ Port facilities

Maintenance and Inspection

Can the change have an impact on:

- ☐ Trip and alarm testing
- ☐ Maintenance procedures
- ☐ Inspections
- ☐ Portable equipment
- ☐ Piping/valve standards
- ☐ Vessel (container) rating
- ☐ Relief valves
- ☐ Pressure isolation
- ☐ Construction/installation
- ☐ Pipelines
- ☐ Drydocking

Operating Procedures

Can the change have an impact on:

- ☐ Operating instructions
- ☐ Start-up of equipment
- ☐ Normal operation
- ☐ Shutdown of equipment
- ☐ Preparation for maintenance
- ☐ Abnormal/emergency operation
- ☐ Commissioning equipment

Explain the possible way(s) in which the checked impact(s) from the Impacts Checklist can be realized. Describe existing risk control measures for each, as well as any recommendations to reduce risk. Use the Risk Matrix in Annex A to aid in assigning a consequence and likelihood ranking for the potential impact.

Preliminary Impact Assessment

Name: Harry M. Electrical
Position/Department: Engineering Department
Name: Joe Engineer
Position/Department: First Assistant Engineer

#	Impacted Aspects	Hazards (during installation & operation)	Detailed Description of Impacts (Consequences)	Existing Risk Control Measures	Risk Consequence/ Likelihood	Recommendations	Residual Risk Consequence/ Likelihood
1	Area classification	Wrong cable installed or improper installation. Potential for developing an ignition source.	Potential for fire in the deckhouse.	Gas detection	Medium Risk Serious/Seldom	Use armored cables for the tie-in	Low Risk Serious/Unlikely
2	Electrical system	Existing circuit	Potential for overloading and tripping the circuit breaker on existing system. Partial blackout of the accommodation.	Circuit breaker. Emergency diesel generator.	Low Risk Minor/Occasional	Existing safeguards are considered adequate.	Low Risk Minor/Occasional
3	Structure	Bulkhead penetration	Loss of watertight integrity between the accommodation and the deckhouse.		Medium Risk Serious/Seldom	Use water-tight penetration seals. Penetration must be watertight and gas-tight to maintain the watertight integrity of the structure.	Low Risk Serious/Unlikely

I-C Implementation Plan Summary

Summarize actions from the preliminary impact assessment and the risk assessment, if one was done. Include any additional actions needed for the execution of the change.

No.	Action Items	Responsible	Due Date
1	Use armored cables for the tie-ins.	HC	During installation
2	Use watertight penetration seals to maintain the water and gas tight integrity of the accommodation structure.	HC	During installation

II Senior Review

Senior Reviewer (Approver)*: Karl Chief **Position/Department:** Chief Engineer **Date:** 3 Mar 10

*Senior Reviewer and Change Owner cannot be same person.

Is there any major impact(s) falling in the High Risk (RED) portion of the risk matrix that cannot be further mitigated? Yes ☐ No ☒	Do you consider this change to be complex Yes ☐ No ☒

Further Study

☐ If the answer to any of the above is YES, recommend this change should be investigated further. Conduct a detailed risk assessment and re-submit the MoC (Part III). Specify subject-matter experts that should participate in the detailed risk assessment: .....

.....

Reject

☐ Reject the change. Explain reasons. .....

.....

Approve

Skip III. Continue to IV.

III Detailed Risk Assessment Review

Attach copies of Detailed Risk Assessment, if one was performed. Amend Implementation Plan as necessary.

Detailed Risk Assessment Contributors

Name: ..... Position/Department: ..... Date: .....

Name: ..... Position/Department: ..... Date: .....

Name: ..... Position/Department: ..... Date: .....

Name: ..... Position/Department: ..... Date: .....

Not Applicable

IV Approval

I am satisfied that the change is justified, it has been adequately designed, its impacts adequately considered and the necessary actions planned.

☒ Proceed with implementation of the change.

☐ Proceed with implementation of the change with the modifications to the Implementation Plan as explained below.

Explanation and modifications to Implementation Plan:

Signed (Approver*) Karl Chief **Date** Mar 3, 2012

**Approver and Change Owner cannot be the same person.*

V Documentation and Training

List documents requiring updating, or new documents required.

Type of Documentation	List Documents	Responsible	Target Date	Date Completed	Verified by
Drawings					
Piping					
Electrical	One line diagram	First Assistant Engineer	6 Mar 10	10 Mar 10	JE
Equipment					
Layout					
Spare parts list					
Operating limits					
Std Operating Procedures					
Startup/SD/Emergency					
Maint. procedures/ schedule					
Emergency response procedure					
Other admin. procedures					
Other					

Identify any training needs

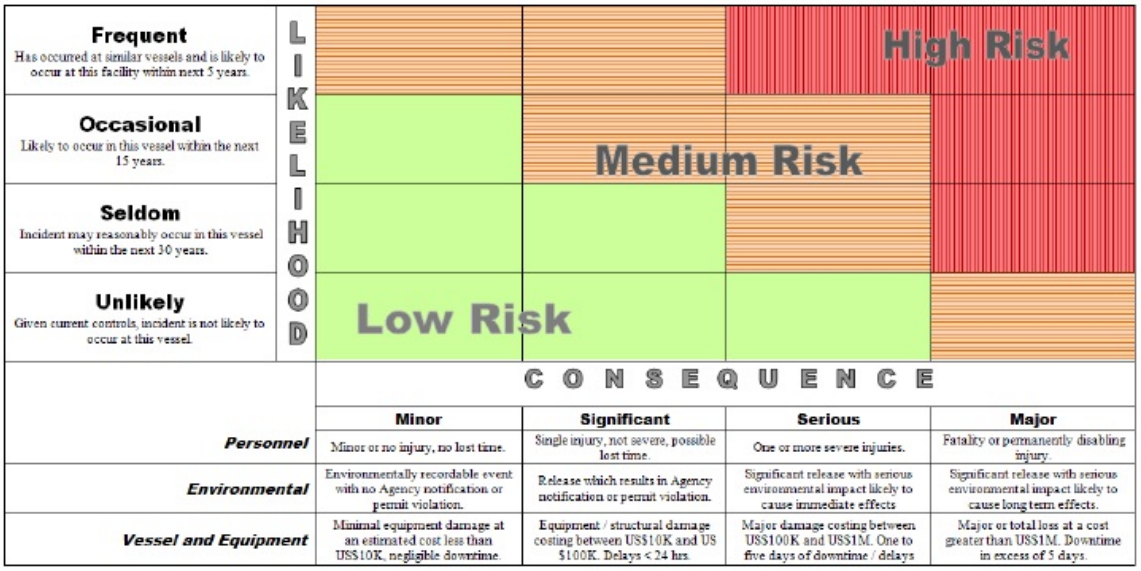
Area	List Training Required	Responsible	Target Date	Date Completed	Initials
Deck:	.....	.....	.....	.....	.....
E/R:	.....	.....	.....	.....	.....
Others:	.....	.....	.....	.....	.....

VI Verification and Closeout

Verification Receptacle is working as intended and the cable penetration is water and gas tight. **Signed:** Joe Engineer **Position:** First Assistant Engineer **Date:** Mar 10, 2010
Temporary Change This Temporary change has been reverted to normal condition/ converted to permanent MoC Permanent MoC reference ..... Signed (*Initiator*) ..... Date ..... Signed (*Approver*) ..... Date .....
MoC Closed Out I am satisfied that the change and the post change actions have been completed **Signed:** Joe Engineer **Title:** First Assistant Engineer **Date:** Mar 10, 2010

Annex A Risk Matrix

Use the attached risk matrix and action criteria for prioritizing the actions generated during the Preliminary Impact Assessment and the Detailed Risk Assessment (if one is conducted).



	Minor	Significant	Serious	Major
Personnel	Minor or no injury, no lost time.	Single injury, not severe, possible lost time.	One or more severe injuries.	Fatality or permanently disabling injury.
Environmental	Environmentally recordable event with no Agency notification or permit violation.	Release which results in Agency notification or permit violation.	Significant release with serious environmental impact likely to cause immediate effects	Significant release with serious environmental impact likely to cause long term effects.
Vessel and Equipment	Minimal equipment damage at an estimated cost less than US$10K, negligible downtime.	Equipment / structural damage costing between US$10K and US $100K. Delays < 24 hrs.	Major damage costing between US$100K and US$1M. One to five days of downtime / delays	Major or total loss at a cost greater than US$1M. Downtime in excess of 5 days.

Action Criteria

Risk	**Preliminary Impact Assessment**	**Detailed Impact Assessment**
Low	No need for Detailed Risk Assessment. Implement suggested risk control actions	Recommend implementation of suggested risk control actions.
Medium	Detailed risk assessment to be conducted, if deemed necessary by relevant personnel.	Suggested risk control actions must be implemented.
High	Detailed risk assessment shall be carried out.	Control actions must be implemented to reduce risk to MEDIUM or LOW