CONTENTS

RISK MANAGEMENT

1. RISK MANAGEMENT

1.1. Scope

Develop an effective safety culture in the Company and on-board ship, where the human element is given regular and effective consideration. This is done by the drafting or amendment of written procedures involves looking at the vessel's activities and operations, identifying what could go wrong, and deciding what should be done to try to prevent it. These documented procedures are the means by which the controls are applied. Its purpose is to facilitate and embed a culture of continuous improvement in safety performance without the requirement for additional regulation.

1.2. Codes

ISM Code1.2.2.2 indicates that one of the safety management objectives of the Company shall be to "assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards". [1]

Maritime Labour Convention 2006 as amended, Standard A4.3 – Health and safety protection and incident prevention, mandates risk evaluations for occupational health and safety risks. Risks due to noise, vibration, disease, exposure to asbestos, fire, and dangerous cargoes and materials, are to be identified and risk reduction controls provided.[2]

ISO 14001/2015 Clause 6.1.1[3]

1.3. Hazard[4]

A hazard is a source of potential injury, harm or damage. It may come from many sources, e.g. situations, the environment or a human element. It has a potential to threaten human life, health, property or the environment.

When assessing the risk, identify the list of the hazards associated with the task. The identification of hazards leads to methods to manage the risks associated with the hazard.

[1] W 18 / 2021
[2] W 18 / 2021
[3] W 18 / 2021
[4] W 18 / 2021

Examples of Hazards Relevant to Shipboard Operations[5]:

i. Shipboard Hazards to Personnel

- Toxic gas/unsafe atmosphere inhalation.
- Burns from chemicals and equipment.
- Electric shock and electrocution.
- Falling overboard.
- Pilot ladder/accommodation ladder rigging; equipment/machinery in operation etc.

ii. Hazardous Substances on Board Ship

- **Accommodation areas**: Combustible furnishings; Cleaning materials in stores; Oil/fat in galley equipment.
- **Deck areas**: cargo; paint, chemicals, oils, greases etc in deck stores; and
- **Machinery spaces**: cabling; fuel and diesel oil for engines, boilers and incinerators; fuel, lubricating and hydraulic oil in bilges, save alls, etc.; refrigerants; and thermal heating fluid systems.

iii. Potential Sources of Ignition

- **General:** electrical arc; friction; hot surface; incendiary spark; naked flame; and radio waves.
- **Accommodation areas (including bridge):** electronic navigation equipment; and laundry facilities – irons, washing machines, tumble driers, etc.
- **Deck areas:** deck lighting; funnel exhaust emissions; and hot work sparking; Machinery spaces: air compressor units; and generator engine exhaust manifold.

iv. Hazards External to the Ship:

- Adverse weather, lightning; shallow water/uncharted submerged objects; and other ships/fixed structures.

[5] W 18 / 2021

Examples of Human Related Hazards[6]

Human error occurs on board ships when a crew member's ability falls below what is needed to successfully complete a task. Whilst this may be due to a lack of ability, more commonly it is because the existing ability is hampered by adverse conditions. Below are some examples (not complete) of personal factors and unfavourable conditions which constitute hazards to optimum performance.

- **Personal factors**
  Reduced ability (e.g. reduced vision or hearing); Lack of motivation; Lack of ability (lack of seamanship, unfamiliarity with vessel), Fatigue, Stress.

- **Organizational and leadership factors**
  Inadequate vessel management (inadequate supervision of work, lack of coordination of work, lack of leadership); Inadequate ship owner management (inadequate routines and procedures, lack of resources for maintenance, lack of resources for safe operation, inadequate follow-up of vessel organization); Inadequate manning (too few crew, untrained crew; and Inadequate routines (for navigation, engine-room operations, cargo handling, maintenance, emergency preparedness)

- **Task features**
  Task complexity and task load (too high to be done comfortably or too low causing boredom); Unfamiliarity of the task; Ambiguity of the task goal; and Different tasks competing for attention.

- **Onboard working conditions**
  - **Physical stress** from, e.g. noise, vibration, sea motion, climate, temperature, toxic substances, extreme environmental loads, night-watch.
  - **Ergonomic conditions**, e.g. inadequate tools, inadequate illumination, inadequate or ambiguous information, badly designed human-machine interface.
  - **Social climate**, e.g. inadequate communication, lack of cooperation; and
  - **Environmental conditions**, e.g. restricted visibility, high traffic density, restricted fairway.

[6] W 18 / 2021

1.4. Risk, Risk Assessment[7], Risk Management Tools

Risk has two elements:

- The likelihood/probability that harm or damage may occur.
- The potential severity of the harm or damage.

Risk is the product of the frequency with which an event is anticipated to occur and the consequence of the event's outcome.

RISK = FREQUENCY X CONSEQUENCE

1.4.1. Risk Assessment[8]

The risk assessment process identifies hazards present in a work undertaking, analyses the level of risk, considers those in danger and evaluates whether hazards are adequately controlled, taking into account any measures already in place.

Effective risk assessments:

- correctly and accurately identify all hazards.
- identify who may be harmed and how.
- determine the likelihood of harm arising.
- quantify the severity of the harm.
- identify and disregard inconsequential risks.
- record the significant findings.
- provide the basis for implementing or improving control measures; and
- provide a basis for regular review and updating.

Various proactive and reactive **risk assessment tools[9]** are used to manage risk, namely:

a. "3 What's" risk assessment.
b. Risk Assessment Matrix.

[7] W 18 / 2021
[8] W 18 / 2021
[9] W 18 / 2021

1.4.2. "3 What's" Risk Assessment

The "3 What's" Risk Assessment is a simple and quick method of assessing risk. Before commencing a task or operation mentally visualise it and ask yourself the following three questions:[10]

i. What can go wrong?

ii. What can cause it to go wrong?

iii. What can be done to prevent it going wrong?

Everyone on board should be encouraged to use the "3 What's" risk assessment every time a new or unfamiliar task or operation is performed or whenever there is an extraordinary factor or influence affecting working conditions e.g. introduction of a jump hose into the cargo loading system, or bad weather conditions. It can be applied to any task even if it is routine.[11]

Persons supervising operations (e.g. mooring) should take a couple of minutes before starting the operation to verbally ask the "3 What's" questions and encourage a response from others who may be involved.[12]

1.4.3. Risk Assessment Matrix (RAM)

RAM is a technique widely used in the marine industry for assessment of risk. It provides a common risk assessment standard that can be used both proactively and reactively to assess and rate the probability and severity of risk. It is used in assessment of risk to evaluate the impact of any change or new operation/task, and during accident and near miss investigation to assess the risk potential.

In order to assess the severity of a risk it is necessary to consider both the probability of it occurring, and the consequence if it does occur. In mathematical terms consequence is inversely proportional to probability of occurrence and this is the basis of RAM.[13]

[10] W 18 / 2021
[11] W 18 / 2021
[12] W 18 / 2021
[13] W 18 / 2021

Personnel RAM example:[14]

RISK FACTOR IS Consequenses X Probability		**Cosequences**			
Probability Level	Description	**Medical treatment**	**Lost Time Incident**	**Temporary Disability**	**1 Fatality or permanent disability**
1	Very Unlikely or Not Probable (1 in 100 years)	1	2	3	4
2	Unlikely or Low Probable (10 - 100 years)	2	4	6	8
3	Possible or Probable (1 to 10 years)	3	6	9	12
4	Likely or Very Probable (1 month - 1 year)	4	8	12	16
Low Risk	**ACCEPTABLE RISK – WORK PROCEEDS NORMAL**			**Risk Factor =**	**< = 3**
Medium Risk	**ACCEPTABLE RISK – EXERCISE CAUTION WITH THESE HAZARDS**			**Risk Factor =**	**>3 < = 8**
High Risk	**UNACCEPTABLE RISK – WORK CANNOT PROCEED TILL FURTHER MEASURES**			**Risk Factor =**	**>8**

1.4.3.1. The Purpose of RAM is to[15]

- Help establish any potential risks inherent in any activity or incident.;
- Evaluate the impact of any change.
- Determine the level of investigation into an accident or near miss, appropriate to the level of risk assessed e.g. a near miss when analysed may have a high-risk potential and would therefore require a more thorough investigation.
- Provide an overview of the potential consequences of incidents; and
- Assist in establishing preventive action to reduce risk as low as reasonably possible (ALARP).

1.4.3.2. Level of Risk is Measured as Follows:[16]

- **Low Risk:** 0 to 3 (green section) – Manage the risk continuously to maintain it at a tolerable level.
- **Medium Risk:** 3 to 8 (yellow section) – Medium priority, reduce the risk to ALARP.
- **High Risk:** 8 to 16 (red section) - Top priority, terminate the activity or treat the risk immediately.

[14] W 18 / 2021
[15] W 18 / 2021
[16] W 18 / 2021

1.4.3.3. Using RAM to Assess Risk (Refer to the RAM Matrix):[17]

- First assess the potential risk and its consequences inherent in any activity or incident, and in terms of its relevance to the shipping industry, also assuming that there is little control in place to reduce the risk. This provides a worst-case scenario and serves as a reminder of the severity of its consequences.
- This is done by considering the probability of the hazard occurring within the shipping industry on the basis of historical evidence or experience e.g. the probability of a person(s) being overcome while entering an enclosed space without proper precautions is high and happens several times per year in the shipping industry.
- The consequence is considered next e.g. multiple fatality (row 4 of matrix). This gives a high-risk potential score of 16 in the red section of the matrix.
- Next identify any existing controls (procedures, tests, alarms, PPE etc.) and consider their effectiveness in lowering the risk. Note: Controls can reduce the probability of an incident occurring but often do not alter the severity of the consequences if it happens.
- Taking into account the controls that are in place repeat the above process, and assess the potential risks and their relevance to the company e.g. it has happened in the company but only required first aid treatment resulting in a potential score of 2 in the green section of the matrix. This indicates that the necessary controls that have been put in place by the company are effective in preventing any mishaps during enclosed space entry, or that the company has just been lucky not to have an incident.

1.5. Master Risk Assessment Template[18]

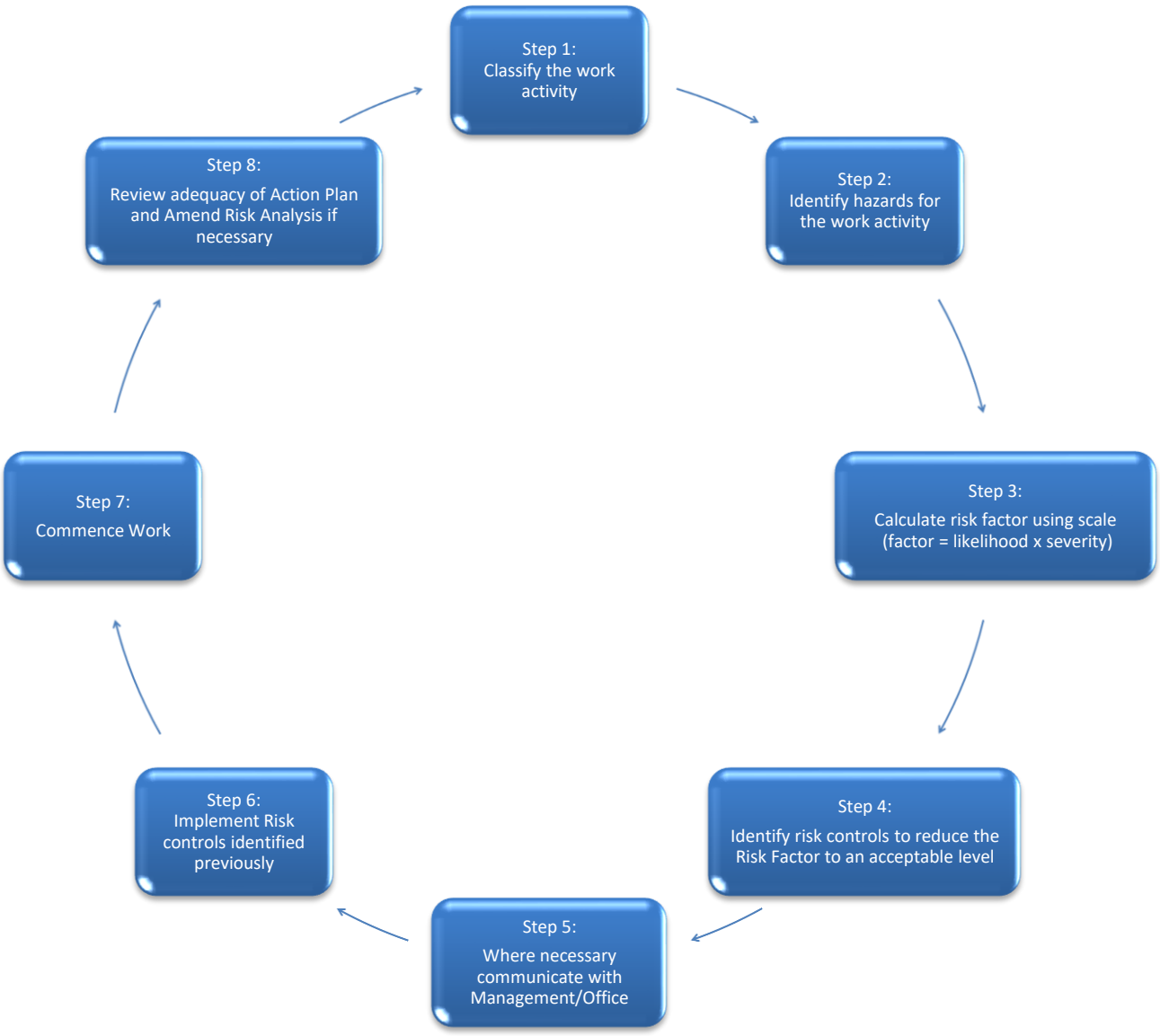
Is a formal proactive risk assessment conducted by the company to assess potential risks that may affect the fleet These Risk Assessments are then populated to the Fleet for their information and reference when completing shipboard operations.

These Risk assessment templates are generic in nature. The vessel specific and task specific risk assessment must be carried out on board by those involved in the work using the templates. The generic risk assessment prepared in office may not include all the factors and environmental conditions that are applicable at the time when task is to be performed on the vessel.[19]

[17] W 18 / 2021
[18] W 18 / 2021
[19] W 18 / 2021

On occasion, the vessel may perform an operation which has not been accounted for by a Master[20] Risk Assessment template[21]. In this instance, the vessel shall complete a Risk assessment. Below is the methodology for the completion of a risk assessment. The risk assessment should be completed in CFM[22]. Where appropriate the completed risk assessment should be forwarded to the Office. Master may also contact office for Risk Assessment template on a task of which master template is not provided in CFM.[23]

1.6. The organogram below describes the process required to complete a Risk Assessment:



[20] W 18 / 2021
[21] W 18 / 2021
[22] W 03 / 2024
[23] W 03 / 2024

Step 1:
Classify the work activity:

- What is the work process?
- The Task to be completed needs to be clearly defined.
- This step is a description of the task.

Step 2:
Identify hazards for the work activity:

A ***HAZARD*** is defined as a source of potential harm / damage **or** a situation with potential for harm / damage to the human life, health, property or the environment.
When identifying a hazard, typically different scenarios under the current prevailing conditions should be considered.
Refer above Hazard section for hazards identification..

Step 3:
For each Hazard Analyse the risk:

A Risk is defined as the combination of the frequency and severity of the consequence.

RISK = FREQUENCY X CONSEQUENCE

Frequency - The number of occurrences per time unit (e.g. “per year” or “once per trip” or “once per ship year”…)

Consequence - The outcome of an accident (quantified by some measure of severity)

The risk factor should be then analysed.

Decide which risks are acceptable, tolerable or unacceptable. In making decisions as to whether the risk is tolerable a lead authority should be consulted.

In CFM typically there are four Main Risk Categories. These are the following:

Risk to Personnel

Risk to Property

Risk to Environment

Risk to Service Loss

The Thresholds for these main risk categories are shown in the graphs as illustrated below.

Personnel

RISK FACTOR IS Consequenses X Probability					
Probability Level	Description	**Medical treatment**	**Lost Time Incident**	**Temporary Disability**	**1 Fatality or permanent disability**
1	Very Unlikely or Not Probable (1 in 100 years)	1	2	3	4
2	Unlikely or Low Probable (10 - 100 years)	2	4	6	8
3	Possible or Probable (1 to 10 years)	3	6	9	12
4	Likely or Very Probable (1 month - 1 year)	4	8	12	16
Low Risk	**ACCEPTABLE RISK – WORK PROCEEDS NORMAL** **Risk Factor =**				**< = 3**
Medium Risk	**ACCEPTABLE RISK – EXERCISE CAUTION WITH THESE HAZARDS** **Risk Factor =**				**>3 < = 8**
High Risk	**UNACCEPTABLE RISK – WORK CANNOT PROCEED TILL FURTHER MEASURES** **Risk Factor =**				**>8**

Property

RISK FACTOR IS Consequenses X Probability					
Probability Level	Description	**Negligible Insignificant (Less than $10 000)**	**Damage to equipment requiring minor repair ($10 000 - $100 000)**	**Localised Damage to equipment requiring repairs ($100 000 - $ 1 Mill.)**	**Damage to equipment resulting in production loss (More than $1 Mill.)**
1	Very Unlikely or Not Probable (once in 100 years)	1	2	3	4
2	Unlikely or Low Probable (10 - 100 years)	2	4	6	8
3	Possible or Probable (1 to 10 years)	3	6	9	12
4	Likely or Very Probable (1 month - 1 year)	4	8	12	16
Low Risk	**ACCEPTABLE RISK – WORK PROCEEDS NORMAL** **Risk Factor =**				**< = 3**
Medium Risk	**ACCEPTABLE RISK – EXERCISE CAUTION WITH THESE HAZARDS** **Risk Factor =**				**>3 < = 8**
High Risk	**UNACCEPTABLE RISK – WORK CANNOT PROCEED TILL FURTHER MEASURES** **Risk Factor =**				**>8**

Environment

RISK FACTOR IS Consequenses X Probability					
Probability Level	Description	**Contained onboard and <1 bbl**	**Contained onboard and >1 bbl**	**Into the Environment and >1 bbl**	**Into the Environment and <1 bbl**
1	Very Unlikely or Not Probable (once in 100 years)	1	2	3	4
2	Unlikely or Low Probable (10 - 100 years)	2	4	6	8
3	Possible or Probable (1 to 10 years)	3	6	9	12
4	Likely or Very Probable (1 month - 1 year)	4	8	12	16
Low Risk	**ACCEPTABLE RISK – WORK PROCEEDS NORMAL** **Risk Factor =**				**< = 3**
Medium Risk	**ACCEPTABLE RISK – EXERCISE CAUTION WITH THESE HAZARDS** **Risk Factor =**				**>3 < = 8**
High Risk	**UNACCEPTABLE RISK – WORK CANNOT PROCEED TILL FURTHER MEASURES** **Risk Factor =**				**>8**

Service Loss

RISK FACTOR IS Consequenses X Probability					
Probability Level	Description	**Less than $10 000**	**$10 000 - $100 000**	**$100 000 - $ 1 Million**	**Greater than $1 Million**
1	Very Unlikely or Not Probable (once in 100 years)	1	2	3	4
2	Unlikely or Low Probable (10 - 100 years)	2	4	6	8
3	Possible or Probable (1 to 10 years)	3	6	9	12
4	Likely or Very Probable (1 month - 1 year)	4	8	12	16
Low Risk	**ACCEPTABLE RISK – WORK PROCEEDS NORMAL** **Risk Factor =**				**< = 6**
Medium Risk	**ACCEPTABLE RISK – EXERCISE CAUTION WITH THESE HAZARDS** **Risk Factor =**				**>6 < = 8**
High Risk	**UNACCEPTABLE RISK – WORK CANNOT PROCEED TILL FURTHER MEASURES** **Risk Factor =**				**> 8**

Step 4: Identify Risk controls to reduce the Risk Factor to an acceptable Level:

It may be necessary to use more than one control measure to manage exposure to risk. Whatever control measures are being chosen, the "hierarchy of control measures" must be taken into account..

Hierarchy of Control Measures

Eliminate the hazard is the most effective control measure and should always be considered first. Sometimes hazards, equipment or work practices can be avoided entirely e.g eliminating a requirement to carry out the tasks. If the hazard cannot be eliminated completely there are a number of control options that can be used to prevent or minimise exposure to the risk. e.g. transferring the weights from one location to other using trolley instead of carrying it manually.

Substituting a less hazardous material, process or equipment. e.g. replacing hazardous chemical by lesser hazardous and eco freindly chemical.

Redesigning the equipment or work process.

Isolating the hazard through **engineering** – separating the worker from the hazard. The isolating techniques are engineered into equipment, such as machine guards, blast shields, plastic sheeting, welding curtains etc.

Administrative controls involve minimising exposure to a risk through the use of procedures or instruction. This could involve limiting the exposure time to a particular hazard such as noise or radiation. Example of administrative controls includes: operating procedure, checklists, Permit-to -work, lock out / tag out,Training, put up notice.

Personal Protective Equipment (PPE) is used as a last resort when exposure to risk is not or cannot be minimised by other means. **PPE** is worn by people as a final barrier between themselves and the hazard. However, PPE as the only way to control a hazard should only be accepted in limited circumstances when the most effective types of controls are not feasible and the risk of not carrying the job outweighs the risk of carrying it out with limited controls, such as during an emergency.

Step 5:
Where necessary communicate with the Office/superintendent:

Where the Risk Factor remains at an elevated level the vessel should communicate with the office in order to obtain approval from the office.

Alternatively risk assessments for the following scenarios are to be submitted to the Office.

- Maintenance or Failure of Critical Equipment
- Failure of Safety Equipment
- UKC policy
- Hot-work not being completed in a designated area.
- Vessel entering a High Risk area (as designated by the ISPS Code)
- Contravention of the HSEQ Management Manual
- Any operation onboard the vessel not covered by the HSEQ Management Manual

- **ALL RISK ASSESSMENTS WHICH ARE HIGH RISK ARE TO BE REVIEWED AND APPROVED BY THE OFFICE PRIOR TO COMMENCEMENT OF THE JOB**

Step 6:
Implement Risk Controls:

The Work Procedures should encompass the new control measures.

These control measures should clearly define the responsibilities of management, supervisors and workers. All relevant persons involved should be made aware about the control measures being implemented.

Adequate supervision should be provided to verify that the new control measures are being implemented and used correctly.

Step 7:
Commence Work:

Work onboard may only commence once **step 4** and **step 5** have been implemented and all involved with the activity has knowledge of the task and is at ease with the job description he/she should complete.

Step 8:
Monitor the task and review the Risks

The person in charge of the task should monitor and review the effectiveness of measures to confirm that:

- The identified control measures are in place and have been implemented as planned.
- The measures being used correctly.
- The exposure to the assessed risks been eliminated or adequately reduced.
- Have implemented control measures resulted in the introduction of any new problems?

If not these are to be addressed as a priority.

2. RISK ASSESSMENT – IMPLEMENTING AND COMMUNICATING RESPONSIBILITY

2.1. Responsibility

It is the responsibility of the Master onboard the vessel to ensure that all stated control measures identified in the Risk Assessments are implemented and all involved personnel are aware of the control measure requirements. Responsible person on board should be assigned the responsibility to implement the control measures identified in the Risk Assessment.[24]

- Related routine and non-routine tasks
- Temporary and permanent changes to procedures or equipment on board the vessel (if necessary)
- Potential consequences of a change, together with any required risk-reduction measures.
- Prioritization of actions (if required)
- Appropriate level of approval.

2.2. Assessment Monitoring and Reviewing

Records of all risk assessments are kept onboard and ashore. DPA's regularly reviews the validity of risk assessments and ensures that any common risk assessments are applied across the fleet.

[24] W 18 / 2021

2.2.1. Risk Assessments MUST be reviewed after every:

i. Accident or a near miss, if applicable

ii. Audit findings, if applicable

iii. When circumstances surrounding the assessment change and it is no longer valid

iv. Changes / modification to the process

v. Regularly but at least annually

2.2.2. When reviewing risk assessments, it is necessary to ensure that:

i. Poor working practices have not crept in;

ii. The stipulated control measures are still being used;

iii. The circumstances under which the assessment was made remain the same.

The Master is responsible to ensure all changes to Risk Assessment are documented and communicated to all persons involved, approved by the office if required. The Risk Assessment Revision on the Risk Assessment Form will be updated after modification. In addition, Risk Assessment will be reviewed during Audits and Inspections.

3. MASTER[25] RISK ASSESSMENTS TEMPLATES[26]

The Master[27] Risk Assessments are held on file in CFM[28]. These are updated periodically from the Office, based in feedback from the Fleet. Risk Assessments are required to be used in the following instances:

- Routine or Non-routine or New tasks[29]
- Maintenance or Failure of Critical Equipment
- Failure of Safety Equipment
- UKC policy
- Hot-work not being completed in a designated area.
- Vessel entering a High-Risk area (as designated by the ISPS Code)
- Contravention of the HSEQ Management Manual
- Any operation onboard the vessel not covered by the HSEQ Management Manual.

[25] W 18 / 2021
[26] W 18 / 2021
[27] W 18 / 2021
[28] W 03 / 2024
[29] W 18 / 2021

The Master is required to submit to the Office any Risk Assessment which indicates that after the implementation of control measures, the residual risk remains unacceptably high. This is indicated by red in the residual risk assessment box in CFM[30]. The Office will then review the assessment and offer more advice or with the Master discuss and make an informed decision on the way forward.

Should the Master[31] Risk Assessment in CFM[32] not cover the required shipboard task, a Risk assessment is to be completed onboard. The Risk Assessment is to be completed using CFM[33]. Please be guided by the methodology described in Section 1.6 of this chapter.

Master[34] Risk Assessments are to have a validity period, if the period expires, the vessel is to request shore management to review the RA and approve an extension or alternative action.

Risk assessments on technical matters to be reviewed and approved by Ship Manager and Risk assessments on navigation, safety and cargo matters to be reviewed and approved by DPA or Marine Superintendent.[35]

4. TRAINING[36]

All officers are required to familiarize themselves with the CFM[37] risk assessment module within 2 weeks of joining the vessel as per Ship Familiarization checklist. CFM[38] risk assessment module is provided with the help section accessible using F1 button. It contains learning material and steps for creating a new risk assessment.

The training templates on CFM[39] Risk Assessment for reference are also provided in the SHEQ / Crew Training / CFM[40] help.[41]

Company safety meeting minutes require risk assessment discussion on two topics which helps ratings to understand the process required for conducting the risk assessment.

Company uses safety campaigns, training video and CBT for educating the crew on board on risk assessments.

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30 W 03 / 2024
31 W 18 / 2021
32 W 03 / 2024
33 W 03 / 2024
34 W 18 / 2021
35 W 18 / 2021
36 W 18 / 2021
37 W 03 / 2024
38 W 03 / 2024
39 W 03 / 2024
40 W 03 / 2024
41 W 37 / 2021

5. RISK ASSESSMENT RECORD KEEPING IN CFM[42]

To be updated

[42] W 03 / 2024